AVIATION WEEK

A McGRAW-HILL PUBLICATION

JUNE 18, 1951

$6.00 A YEAR

THE M. W. KELLOGG CO.
JUN 20 1951
LIBRARY

We practice what we preach!

For over twenty years, Goodyear has been the only company in our industry to maintain its own private fleet of aircraft in order to better serve its aviation clients.

The planes shown below—maintained for the exclusive use of our Aviation Sales Engineers—*fly the equivalent of eight times around the world every year!* As a result, we've been "Johnny on the spot" with our sales help and services—whenever and wherever Goodyear Aviation Products have been needed.

It's more than just a sales fancy on the part of our men—there's proof that speaks for the results. Facts like:

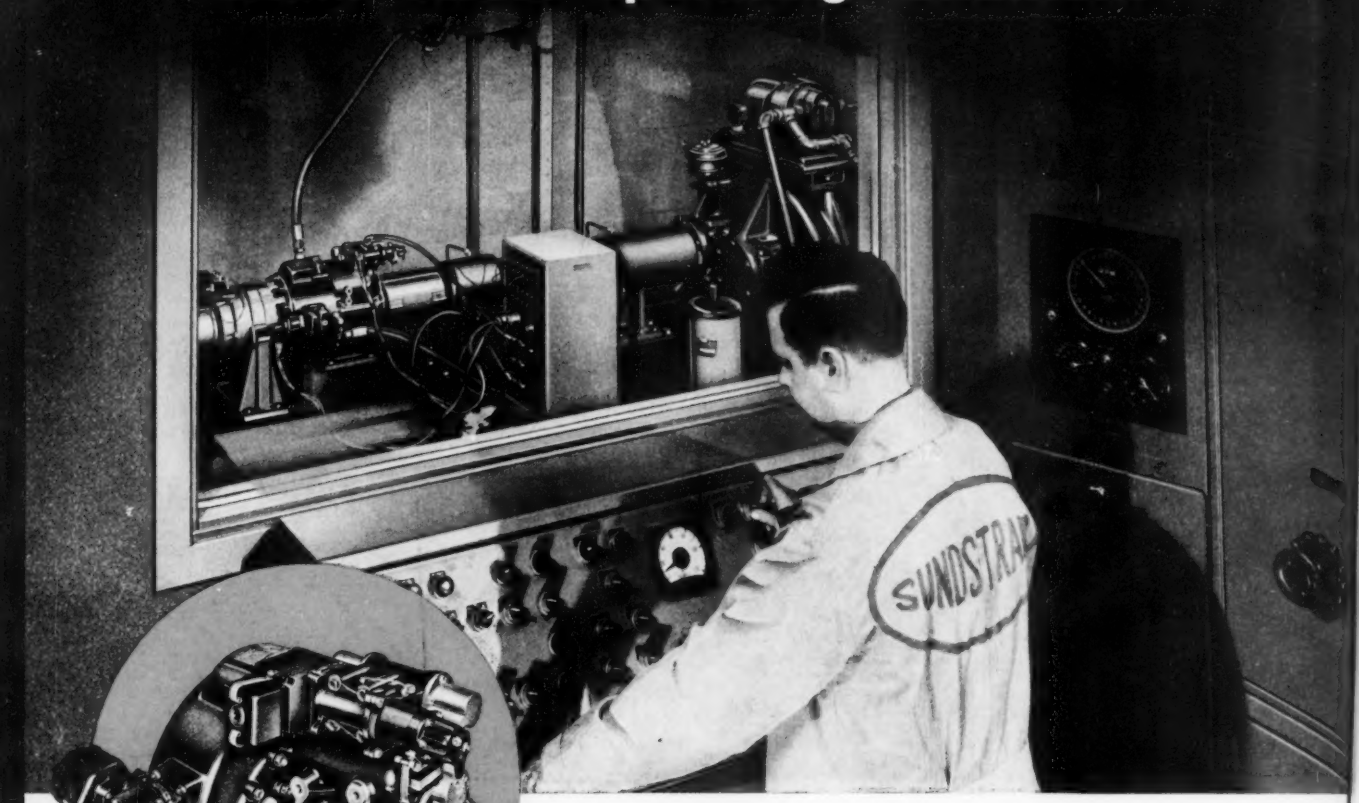
MORE AIRCRAFT LAND ON GOODYEAR TIRES, TUBES, WHEELS AND BRAKES THAN ON ANY OTHER KIND

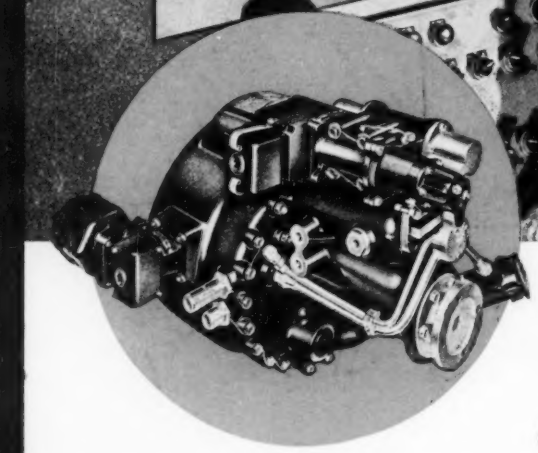
GOODYEAR AVIATION PRODUCTS

Goodyear, Aviation Products Division
Akron 16, Ohio or Los Angeles 54, California

M W KELLOGG CO
P O BOX 469
JERSEY CITY 3 N J
PETROLEUM RESEARCH LIBRARY

Each Sundstrand hydraulic drive run-in under actual operating conditions...





Less than ± ½ of 1% frequency variation permitted on 400 cycle output!

Constant speed drives for the alternators on the B-36 get the "full treatment" on Sundstrand test stands. Directly connected to each test stand is a power-absorbing "load bank" which duplicates the characteristics of all control functions on the plane. As in the airplane, the operator can bring additional alternators on the line to make sure that the constant speed drives will operate in parallel and divide the electrical load, regardless of engine speeds or applied load. *Less than ± 2 cycle frequency variation is permitted on 400 cycle output!* This is the type of testing and run-in equipment which verifies Sundstrand's *reliable* research, *expert* engineering, and *precision* production of specialized aircraft hydraulic products.

SUNDSTRAND

SUNDSTRAND HYDRAULICS

SUNDSTRAND MACHINE TOOL CO.
HYDRAULIC DIVISION, ROCKFORD, ILL.

AIRCRAFT AND INDUSTRIAL HYDRAULIC TRANSMISSIONS, PUMPS, MOTORS, AND VALVES • OIL BURNER PUMPS • AIR SANDERS
LATHES, MILLING, BROACHING AND SPECIAL MACHINES • BROACHING TOOLS • MAGNETIC CHUCKS

B.F.Goodrich

4 hot ideas for fighting ice

The pipe that flies like a plane. Boeing's new Flying Boom for in-flight refueling (upper left) is actually flown into place by means of vee-shaped ruddevators. To provide accurate control, these ruddevators had to be protected against ice. B. F. Goodrich developed special electric rubber pads for the leading edges that supply spot anti-icing heat.

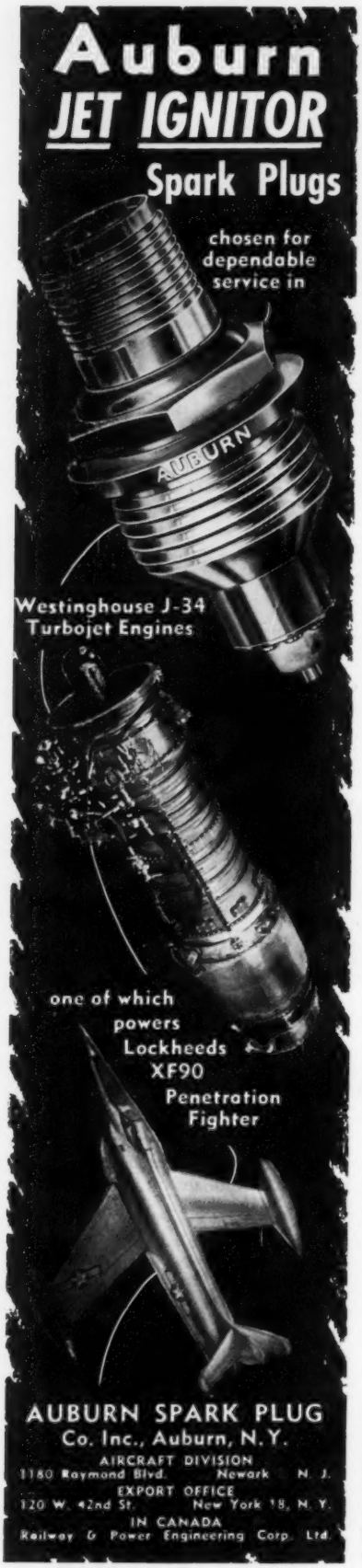
Electric blankets keep new Arctic plane from freezing. Designed for Arctic rescue work, Northrop's new C-125 (upper right) had to have ice protection at all vital spots. BFG electric rubber "blankets" turned the trick for three parts—antenna mast, elevator horn and air scoops. Because of the design flexibility of electric rubber, wide variation in the shape of these three parts proved no obstacle.

Keeps ice from choking jet's throat. Ice forming in the narrow "throat" of a jet engine intake could choke off the air supply, make the engine quit cold. This threat has been eliminated on North American's B-45 (lower left) with a special lining of BFG electric rubber inside the cowl.

Rubber makes gasoline stretch. To help flight engineers adjust fuel supply for maximum efficiency, a hydraulic line transmits propeller load to an instrument panel dial. But cold was congealing the oil, causing false readings. BFG engineers sheathed the hydraulic line in electric rubber to keep the oil fluid, save gasoline. This heated line is now standard on TWA Constellations (lower right).

B. F. Goodrich electric rubber is tough, thin rubber with a core of resistance wires that provide spot heat precisely as needed. Two lead wires attached to the airplane's regular power supply are the only other equipment required. Electric rubber can be made to fit any size, any shape airplane part. For help with your problems write to *The B. F. Goodrich Company, Aeronautical Division, Akron, Ohio.*

B.F.Goodrich
FIRST IN RUBBER



Aviation Week

ABP Member ABC

Volume 54 — **June 18, 1951** — **Number 25**

Headline News

Vandenberg Expected to Step Out.... 13
Mass F-84 Crashes Traced..... 15
New F-84 Fitted for Air Refueling.... 16
Plane Whose Wings Change Sweep.. 16
GE Reveals More Powerful J-47s..... 17
Subsidy Separation Bill..... 18
First Details on U. S. Jet Transport... 19

Production Engineering

Optical Tooling Faces Biggest Test... 27
New Instrument to Study Gusts..... 39
Gust Alleviators 48
NACA Reports 54

Avionics

New Radar Trainers for USAF..... 57

Financial

Copters Lure Speculating Public..... 61

Equipment

All Big DC-6 Fleets Go to Skydrol.... 65

Sales & Service

Hewitt Enters Conversion Business... 77

Air Transport

Airlines Told How Jets Can Earn.... 83
TWA, C&S Told Hurry Interchange.. 84
Speed Copter Work, ACC Urges..... 84
Civil Priorities Changes..... 85
CAB Seeks Mergers to Aid Transport.. 86

Editorials

Pilots, Painters & Safety..... 98
Washington Is Like This..... 98
An Old & Tragic Story..... 98
Learn from the Rails..... 98

Departments

News Digest 7
Sidelights 8
Picture Page 9
Who's Where 11
Industry Observer 11
Washington Roundup 12
New Aviation Products..... 73
Also on the Market..... 74
Shortlines 87
Aviation Calendar 89
Cockpit Viewpoint 96
What's New 96

36,059 copies of this issue printed

Robert H. Wood
EDITOR

Merlin H. Mickel.....MANAGING EDITOR

William Kroger.....Assistant Managing Editor
Alexander McSurely..Assistant Managing Editor
Irving Stone.....Technical Editor
Ben Lee.....Military Editor
G. L. Christian, III.Equipment & Maintenance
David A. Anderton.....Engineering
F. Lee Moore.....Transport
Katherine Johnsen.....Congress
Henry Lefer.....News Desk
Scott H. Reiniger.....Editorial Assistant
Victoria Giaculli.....Editorial Assistant
Erwin J. Bulban.....Special Assignments
Thomas M. Self.....Los Angeles
Leo T. Tarpey.....Editorial Makeup

Editorial Offices: 330 West 42nd St., New York 18, N. Y., Phone Longacre 4-3035 National Press Bldg., Washington 4, D. C., Phone National 3414.

Domestic News Bureaus: Atlanta 3, Rhodes-Haverty Bldg.; Chicago 11, 520 N. Michigan Ave.; Cleveland 15, Hanna Bldg.; Detroit 26, Penobscot Bldg.; Los Angeles 17, 1111 Wilshire Blvd.; San Francisco 4, 68 Post St.; Houston, 514 South St. *Correspondents* in more than 60 major cities.

Foreign News Bureaus: London, Paris, Frankfort, Tokyo, Bombay, Melbourne, Rio de Janeiro, Mexico City. *Correspondents* in more than 50 major cities.

Robert F. Boger
PUBLISHER

R. W. Martin, Jr., *Sales Manager*; J. G. Johnson, *Business Manager*; Anita Scaffo, *Research and Marketing*; Sales Representatives: J. C. Anthony, New York; M. J. Storz, Philadelphia; H. P. Johnson, Cleveland; L. J. Biel, Chicago; W. F. Donnell, St. Louis; James Cash, Dallas; R. C. Maultsby, Atlanta; J. W. Otterson, San Francisco; C. F. McReynolds, Los Angeles. Other sales offices in Pittsburgh, Detroit, Boston, London.

June 18, 1951 — AVIATION WEEK — Vol. 54—No. 25

Member ABC and ABP

Published weekly by McGraw-Hill Publishing Company, Inc., James H. McGraw (1860-1948), Founder. **Publication Office: 99-129 North Broadway, Albany 1, N. Y.**

Executive, Editorial and Advertising Offices: McGraw-Hill Building, 330 W. 42nd St., New York 18, N. Y. Curtis W. McGraw, President; Willard Chevalier, Executive Vice-President; Joseph A. Gerardi, Vice-President and Treasurer; John J. Cooke, Secretary; Paul Montgomery, Senior Vice-President, Publications Division; Ralph B. Smith, Editorial Director; Nelson Bond, Vice-President and Director of Advertising; J. E. Blackburn, Jr., Vice-President and Director of Circulation.

Subscriptions: Address correspondence to AVIATION WEEK—Subscription Service, 99-129 N. Broadway, Albany 1, N. Y., or 330 W. 42nd St., New York 18, N. Y. Allow ten days for change of address.

Please indicate position and company connection on all subscription orders.

Single copies 50¢. Subscription rates—United States and possessions, $6 a year; $9 for two years; $12 for three years. Canada, $8 a year; $12 for two years; $16 for three years, payable in Canadian currency at par. Pan American countries, $10 a year; $16 for two years; $20 for three years. All other countries, $20 a year; $30 for two years; $40 for three years. Entered as second-class matter, July 16, 1947, at the Post Office at Albany, N. Y., under Act of Mar. 3, 1879. Printed in U. S. A.

Copyright 1951 by McGraw-Hill Publishing Co., Inc.—All Rights Reserved. Cable address "McGraw-Hill New York." Publications combined with AVIATION WEEK are AVIATION, AVIATION NEWS, AIR TRANSPORT, AERONAUTICAL ENGINEERING and AIRCRAFT JOURNAL. All rights to these names are reserved by McGraw-Hill Publishing Co.

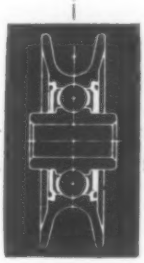
ENGINE AND AIRPLANE CORPORATION

FAIRCHILD

20 YEARS

FAFNIR

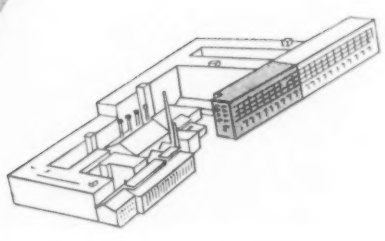
Extraordinary diversification studded with outstanding contributions... that's Fairchild's record. It covers trainer and transport planes, guided missiles, and nuclear energy for propulsion of aircraft. Such varied activity takes unique teamwork within and without the organization. On bearing problems, it's been Fafnir's privilege to "team-up" with Fairchild since Fairchild was established over 20 years ago. More than just good bearings are responsible for this long association . . . the Fafnir attitude and aptitude, a way of looking at ball bearings from the designer's side, an aptitude gained from more than 20 years' specialization in aircraft ball bearings. The Fafnir Bearing Company, New Britain, Connecticut.



Fafnir Fairlead Type Ball Bearing, one of the Fafnir products regularly specified by Fairchild. Sturdily constructed, and equipped with stainless steel shields for lubricant retention.

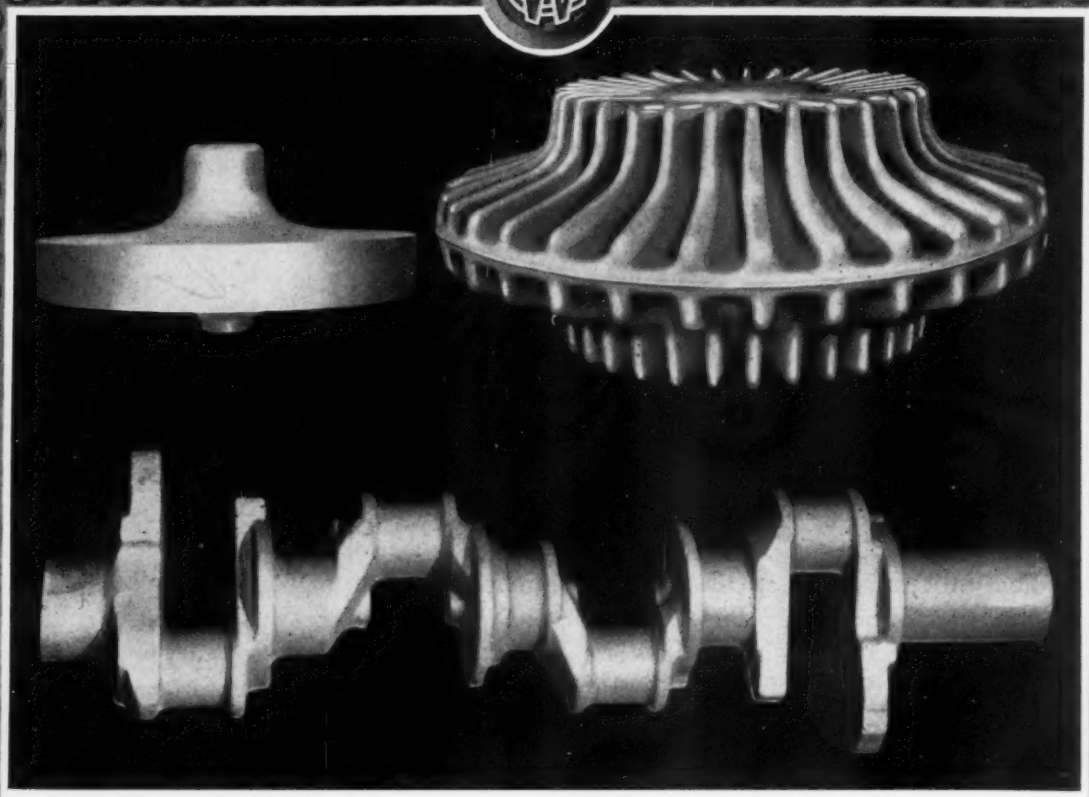
★ PROGRESS REPORT

NEW PLANT ADDITION!



To try to keep abreast of an unprecedented demand for Fafnir Ball Bearings, we're doing our best to provide greater production facilities.

One phase of this expansion program is the recently completed, 6-story modern addition to the main Fafnir Plant. It adds 70,000 square feet of manufacturing space to the 750,000 previously included in the 4 Fafnir Plants . . . now, almost 19 acres.



Wyman-Gordon—specialists in the vital forgings of the internal combustion engine since its inception—is today the largest producer of crankshafts for the automotive industry and of all types of forgings for the aircraft industry. Be it crankshafts and other vital forgings for the piston type engines or turbine wheels and impellers for turbo jets—there is no substitute for Wyman-Gordon experience.

Standard of the Industry for More Than Sixty Years

WYMAN-GORDON

FORGINGS OF ALUMINUM • MAGNESIUM • STEEL

WORCESTER, MASSACHUSETTS

HARVEY, ILLINOIS DETROIT, MICHIGAN

NEWS DIGEST

DOMESTIC

North American Aviation delivered its 45,000th military plane, an F-86E Sabre, to the USAF on June 7. The company's first plane, delivered to the Air Corps in 1936, was a BT-9 basic trainer. During World War II, NAA manufactured 14 percent of all planes built in the U.S., has delivered about 5,000 planes since Apr. 1, 1945. Its total includes 16,428 fighters, 10,970 bombers and 17,278 trainers.

American and United Air Lines' pilots will fulfill 30-day waiting periods and be free to strike on June 24. UAL employes notified company on May 24 that they may strike, following breakdown of negotiations. The 30-day period also began for AA pilots the same day, when Presidential Emergency Board handed down its recommendations in the AA pilot dispute. Pilots say there hasn't been a general pay increase since 1945.

Albert Henry Near, a former vice president of the National Aeronautics Assn., died May 27. He was 54 years old.

Taylorcraft, Inc., will begin deliveries in about 90 days on its four-place Tourist to cost $5,950 F.A.F., Conway, Pa. The plane will be fitted with a 145-hp. Continental six-cylinder engine, cruise at 115 mph., have a normal range of 500 mi., and carry a useful load of 925 lb.

Regent Rocket 260 five-place all-metal executive plane (AVIATION WEEK Apr. 30), is making a tour of military installations to demonstrate the plane's capabilities. The itinerary includes Wright Field; Washington, D. C., for Navy inspection; and Ft. Bragg for Army Field Forces evaluation.

Local service airline seminar, Purdue University, Lafayette, Ind., June 21-22, will have all five members of CAB, and the Administrator and Deputy Administrator of CAA present. Chief items on the agenda: local air service to smaller towns, and particularly to the Midwest airports; sales; aircraft for local service; economics; airway and landing aids.

CAB Examiner R. Vernon recommends National Airlines be given CAB permission to operate daylight DC-6 air coach, New York to Miami, with proposed $58 one-way fare, compared with $53 night coach, $76 regular fare, and off-season 16-day excursion net one-way cost of $57. EAL opposes the services, but says it will start competitive daylight coach flights with Constellations if the NAL flight is approved.

Col. J. Francis Taylor, Jr., USAF All-Weather Flying Division chief, Wright-Patterson AFB, won the 1950 bronze plaque of the Corporation Aircraft Owners Assn. for his work in developing all-weather navigation aids and instruments contributing to safety and utility of all forms of air transport.

FINANCIAL

Garrett Corp. reports preliminary consolidated net profit of $1,295,572 after federal income taxes for the nine months ended Mar. 31. Gross revenues for the period were $21,861,319. A 40-cents-per-share quarterly dividend was announced payable June 20 to holders of record on June 2. Backlog of the AiResearch Mfg. Co., and AiResearch Mfg. Co. of Arizona has increased to about $63 million.

INTERNATIONAL

Gen. P. Pinna-Parpaglia of Italy was elected president of the fifth assembly of the International Civil Aviation Organization at Montreal. Named as vice presidents are Dr. Enrique M. Loaeza, Mexico; Sphrang Devahastin, Thailand; L. E. Lang, South Africa; and K. G. Hulstrom of Sweden.

Scheduled copter airline service in Britain was begun June 1 by British European Airways Corp. using Westland-Sikorsky S-51s between London and Birmingham.

First of about 100 USAF North American T-6 trainers are arriving at RCAF training bases on loan for training of Canadian and North Atlantic Treaty Nations airmen. These planes will be used while Canadian production of the T-6 gets underway at Canadian Car & Foundry's Ft. William, Ont., plant, which made Texans during the last war. Ft. William is expected to turn out 1,000 T-6s.

Trans-Canada Airlines showed an overall deficit in 1950 operations of $1,325,205, against $4,317,593 in 1949, with domestic operations coming out of the red for the first time since 1945 with a profit of $201,206. Trans-Atlantic operations showed a $1,526,412 deficit compared with $2,898,149 loss in 1949.

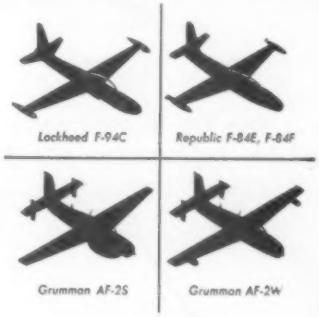
The ROTORette approaches the ultimate in simplicity for a two-position rotary actuator because of its unique load-sensitive feature.

Motion is controlled *positively* by adjustable mechanical limit stops. The adjustable load-sensitive limit switches are de-energized whenever the actuator either reaches the limits of mechanical travel or encounters the maximum permissible load. This construction provides two essential characteristics for dependable operation of valves, dampers, etc., up to 50 inch-pounds maximum operating load:

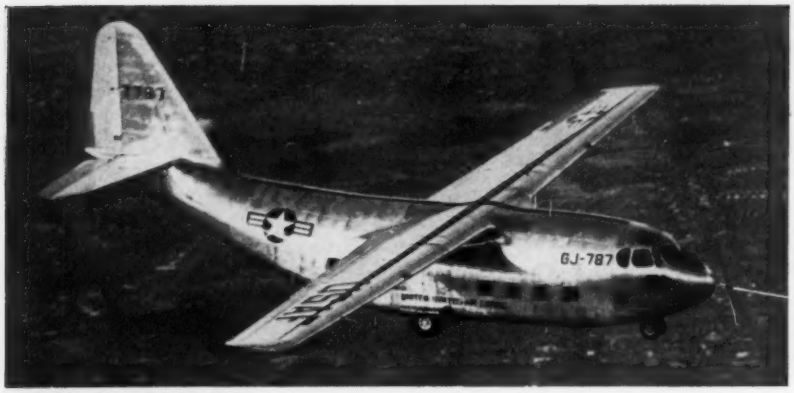
1. Accurate positioning of the driven device
2. Elimination of damage from overtravel or overload

See condensed literature in 1951 I.A.S. Aeronautical Engineering Catalog or write for Bulletin 118.

ROTORette
is currently used on these planes



AIRBORNE
ACCESSORIES CORPORATION
Note our new address 1414 Chestnut Avenue Hillside 5, New Jersey
LOS ANGELES, CALIFORNIA • DALLAS, TEXAS • OTTAWA, CANADA



IT'S A GLIDER . . .

. . . IT'S A PISTON PLANE . . .

. . . IT'S A JET PLANE

". . . THE FIRST AIRCRAFT IN THE WORLD TO HAVE FLOWN PISTON POWERED, JET POWERED, OR AS A GLIDER . . ." (AVIATION WEEK MAGAZINE APRIL 30, 1951)

Chase AIRCRAFT CO., Inc.
WEST TRENTON, NEW JERSEY
STROUKOFF AVITRUC

SIDELIGHTS

Air Force

Secretary Finletter last week was inspecting Pacific air bases and conferring with FEAF commanders in Tokyo on status of equipment. Nils Lennartson, Deputy Director of Public Relations, was in his party. . . . **Air Materiel Command** is testing a prefabricated Higgins hangar which can be assembled in a day and can accommodate one jet fighter. Primary function is to reduce time for pilots to become airborne during an alert. . . . **Hotel Highland Pines Inn,** Southern Pines, N. C., near Ft. Bragg, has been leased by AF, expanding its air ground operations school at Pope AFB. The acquisition will enable Tactical Air Command to graduate about 6,000 Army, Navy & AF students per year.

Air Transport

Eastern Air Lines was high bidder on CAA's unused C-54, at about $335,000, and will not sell it to another carrier, despite reports. EAL also purchased a second CAA C-54, badly cannibalized, for about $125,000. Such is the shortage of transports these days. . . . **Northwest** is sleuthing for relics of its 25-year past to exhibit at a silver anniversary program. It especially seeks the three original Stinson Detroiters that started its service in 1936. It has no clues but does have leads on a former NWA Ford trimotor in Alaska, an open-cockpit job dusting western crops and the first NWA DC-3, which is reported in South America. . . . Nonsked Alaska-Seattle carrier, **Air Transport Associates,** will fight the Alaska service case decision of CAB, as amended by President Truman. Its president, Amos Heacock, who is also president of the nonskeds' assn., will take the case to CAB and the courts if necessary.

They Come & Go at CAA

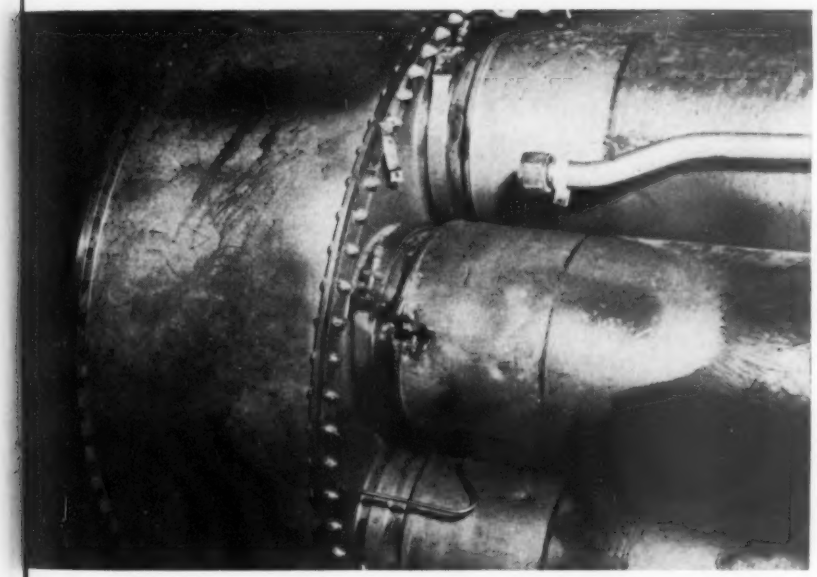
Morwick Ross is named executive assistant to CAA Administrator Charles F. Horne, filling the post vacant since resignation of Edward M. Sturhahn. Ross formerly was assistant to three successive assistant secretaries of Commerce—John Alison, C. V. Whitney, and Thomas W. S. Davis. . . . **E. C. Marsh** is named chief of the Technical Staff Division of the Office of Aviation Safety, succeeding John F. Warlick, on active duty as a major in USAF. . . . **Lt. Col. R. F. Fender,** former chief of the General Flight Branch of Flight Operations Division, has gone to MATS, and is succeeded by **W. B. Sprague.** The division also lost **Lt. Col. John Rodgers,** chief of special operations, succeeded by **R. O. Blanchard,** and **Maj. Gordon Becker,** a flight operations specialist, both to USAF. . . . In the Aircraft Division, **Lt. Col. Joseph Boudwin,** with CAA since 1929, goes on active duty with USAF in Washington. **Lt. Col. John Guilmartin** has left his post as deputy chief in Airman's Division to go on active duty at Kelly Field. International Region lost **Lt. Col. Richard Schall** and **Col. C. F. Taylor.**

(Continued on page 88)

AILERON was blasted by Red fire which chewed a considerable piece of the surface out, but didn't down the plane.

FLAP took a direct hit by a shell and the fuselage was also stitched by smaller arms fire during a strafing run.

How Thunderjets Fare Under Fire



COMBUSTION CHAMBER (above) was punctured by 50-cal. slug, which also damaged J-35's diaphragm and turbine wheel, but did not cripple engine.

Even when the Communists in Korea manage to tag an American plane they have a hard time making it stick, as proven by these pictures of combat-damaged Republic F-84 Thunderjets which returned to fight another day.

These F-84s of the 27 Fighter-Escort Wing, who have been in action steadily since December, 1950, are credited with knocking down or damaging 15-20 MiG 15s, during well over 10,000 combat hours in Korea.

The 27th's major mission, however, has been the support of UN ground forces, and it is reported to have inflicted 10,000-15,000 casualties on enemy troops, destroyed more than 12,000 buildings, numerous gun emplacements, command posts and other military objectives.

These missions can be hazardous even when the enemy doesn't shoot back. Take the case of one F-84 pilot, who released a napalm tank, felt the fire bomb bump his plane, and watched it roll up and over the fuselage where it split open. He came back with jellied gasoline coating the jet. Another pilot had a rocket misfire through his plane's wing. He too got back.

HORIZONTAL STABILIZER and elevator (below) were mostly carried away by a shell hit. Pilot reported plane "shook a little."

EXHAUST CONE (below) was thoroughly "salted" by Red machine gun fire, vertical fin also stood up to a heavy hit.

For more than 20 years leading U.S. planes have used MACWHYTE AIRCRAFT CABLE

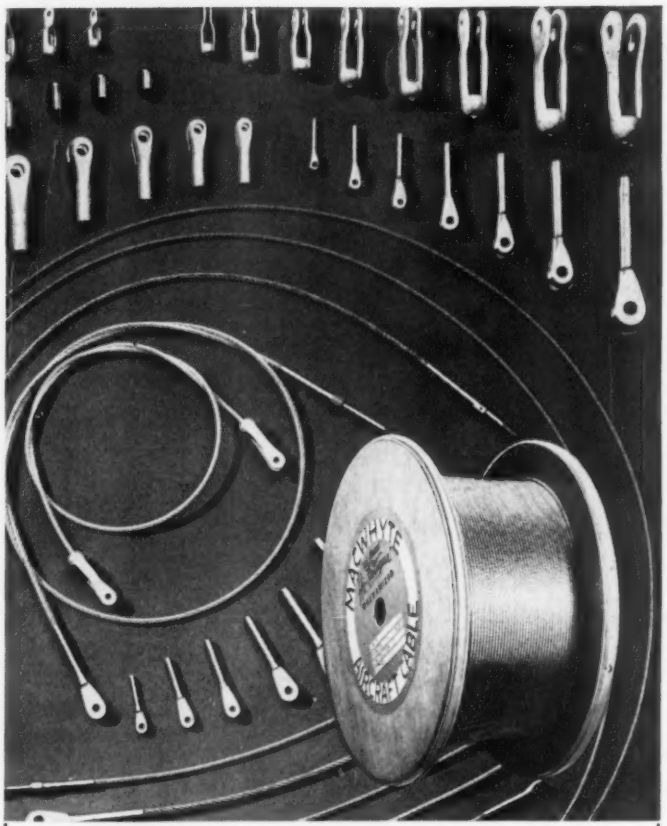
Building hundreds of millions of feet of cable gives the "know-how" needed for better service

The skilled craftsmen who have made hundreds of millions of feet of Macwhyte "Hi-Fatigue" Aircraft Cable are experienced in every phase of its manufacture . . . in product engineering . . . metallurgy . . . precision fabrication.

Macwhyte "Hi-Fatigue" Aircraft Cable has minimum, uniform stretch. And being properly PREformed, it lays dead with no tendency to twist or curl. When properly cut, there is no tendency for wires or strands to unlay or move out of position. It is preferred by rigging departments . . . the men who must handle and make cable assemblies and install them. It is used by leading aircraft manufacturers and airlines.

Controls made with Macwhyte reliable "Hi-Fatigue" Aircraft Cable and "Safe-Lock" swaged terminals are noted for their superior quality to resist wear, and bending fatigue. Maximum efficiency, long life, and greatly reduced maintenance save time and money.

Catalog and literature are available on request.



Macwhyte "Hi-Fatigue" Aircraft Cable is supplied in reel lots, specified lengths, and cable assemblies.

Macwhyte "Safe-Lock" and "Socket-type" terminals are supplied loose or attached to cable.

MACWHYTE COMPANY

2905 Fourteenth Avenue, Kenosha, Wisconsin. Manufacturers of "Hi-Fatigue" Aircraft Cable · "Safe-Lock" Cable Terminals · Cable Assemblies · Tie Rods · Braided Wire Rope Slings · Bright, Galvanized, Stainless Steel and Monel Metal Wire Rope.

Member A.D.M.A. and A.I.A.

"Hi-Fatigue" is a registered trademark.

1008-A

WHO'S WHERE

In the Front Office

William Schweizer has been made vice president-manufacturing of Schweizer Aircraft Corp., Elmira, N. Y. Younger brother of **Ernest Schweizer**, president, and **Paul Schweizer**, vice president-general manager. William was production manager of the company from 1941-1946 and returns after serving for several years on the staff of Long Island Agricultural and Technical Institute.

Robert N. Herrnstein has been designated vice president-controller of Colonial Airlines. Herrnstein, who has been in the airline industry for over 16 years, is a member of the Airline Finance and Accounting Conference and the Aeronautics Association of Boston. In another executive move, the carrier named **L. Orville Cameron** vice president-secretary. Cameron was formerly chief of the examining section, Bureau of Air Operations, CAB, which department he joined in 1943.

Changes

A. A. Hoehling, former newsman, has joined Trans World Airlines' public relations staff as production manager. . . . **L. Keith Covelle** has been appointed Kaiser-Frazer aircraft representative at Wright Field. . . . **Robert C. Raab** has been made manager of the Aircraft Products division of Extruders, Inc., Culver City, Calif.

Samuel Lipton has joined newly formed Central Aviation & Marine Corp., MacArthur Airport, New York to handle the firm's sales and service department. . . . **Arthur L. Birdsall** has been named assistant general manager of the Saval division of Wm. R. Whittaker Co. Ltd. . . . **Owen L. Marsal** has been made manufacturing manager of Lincoln-Mercury division's new gas turbine plant which is to build the Westinghouse J-40 jet for the Navy. **R. E. Bussey** will be chief engineer on the J-40 project and **H. F. Roberts** has been named purchasing agent.

Warren L. Duncan has been designated superintendent of interline sales and development for Mid-Continent Airlines. . . . Sq. Ldr. **L. C. Giles** has been named general manager of Bahama Airways Ltd., subsidiary of BOAC.

G. (Jerry) Miller has been appointed superintendent of inspection for Eastern Air Lines. . . . **George M. Messenger** has been made maintenance representative for the Flying Tiger Line on military and foreign government contracts. . . . **Paul K. Winters** has been designated supervisor of navigation for Northwest Airlines.

Hugo K. Mayr has been designated North American manager for Swissair. . . . **James A. Butcher** has been named superintendent of aircraft engineering for Northwest Airlines at St. Paul, and **Harley M. Thorson** has been made supervisor of performance engineering. . . . **Herbert J. Lyall, Jr.**, has been appointed director of passenger sales for American Airlines entire system of operations.

INDUSTRY OBSERVER

► One of the fastest combat intelligence operations of the Korean struggle was involved in the gathering of wreckage of a Russian MiG 15 plane shot down over Korea by USAF F-86 fighters (AVIATION WEEK June 11). Helicopters were flown to the crash to gather parts and wreckage, and flew them back behind our lines, for transfer to a larger plane for removal to Tokyo. Here the parts were fine-graded for manufacturing intelligence. Beautiful precision workmanship on the engine, and incorporation of improvements which gave the Nene development high performance without water injection or afterburner, were a revelation to the USAF engineers who examined the material. Statement of USAF spokesmen that USAF has not yet captured a MiG 15 or one of its engines (AVIATION WEEK June 11) apparently referred to a complete airplane and complete engine.

► **Lockheed Ventura bombers of World War II are coming back into the executive plane market since a recent CAA extension of NL licensing requirements for the plane. The Babb organization is bringing several Venturas over from Europe after preliminary overhaul at a KLM base in Holland.**

► Ford Aircraft Engine division, Chicago, expects to have parts completed by Nov. 1 for its first Pratt & Whitney R-4360 engine to be built at Chicago. Ford is pushing to complete the engine within 60 days afterward. It is planned that the Chicago plant will build 216 of the 3,140 different parts for the three different dash number models of the R-4360 which Ford has contracted to make. Other parts will be built by the Ford Rouge plant, Ford Cincinnati plant, and hundreds of subcontractors on the engine.

► **Going price on the used plane market for Douglas DC-3s in fairly good condition, when one of the scarce items can be found, is now reported at between $85,000 and $100,000, or more than the airplane sold for brand new.**

► Glenn L. Martin Co. has already offered technical and engineering service to Transocean Air Lines in connection with the two Martin 2-0-2s which TAL has leased from Northwest Airlines for transcontinental coach operations. The Martin company expects to make similar technical services and spares available to other 2-0-2 operators who make similar leasing arrangements with Northwest.

► **The new Hayes Aircraft Corp. project to overhaul and modify North American B-25 bombers as trainers and executive transports for the Air Force at the 1.5-million sq. ft. Birmingham modification center probably will be only the first in a series of contracts to the new company. Harry T. Rowland, Hayes president and general manager, was formerly executive vice president of the Glenn L. Martin Co. Hayes Aircraft Corp. is a subsidiary of Hayes Manufacturing Corp., Grand Rapids, an automotive company.**

► Glenn L. Martin Co. expects to get the first production 4-0-4 in the air at Middle River Airport, Md., by the end of June.

► **Army spokesmen recently told Congress that they were pushing ahead the Nike ground-to-air guided missile rapidly; that Western Electric Co. was allotted $15 million to tool for production of the missile; and that another $15 million was going to a firm not yet determined, to manufacture the propellant for this missile.**

► First all-Canadian jet plane, the Avro Canada CF-100 Canuck, powered with two Avro Canada Orenda engines, is now being groomed for its first flight. Production models of the night fighter will be powered with the Orendas. Earlier pre-production models of the plane have used two British Rolls-Royce Avon jet engines. Orendas have previously been flight tested in a Lancaster flying test bed and in a North American F-86 Sabre jet fighter.

Washington Roundup

Sherman's Outlook

Chief of Naval Operations, Adm. Forrest Sherman, makes only one flat prediction on the future of military strategy and the composition of the armed services: The trend toward more and more emphasis on air power, both carrier and land-based, will go on indefinitely.

Beyond that, there are too many "buts" in the picture for flat predictions. The years since the 1911 Boston Aero meet that first spurred his interest in aviation, he says, have taught him not to make predictions.

The Navy's chief made these points in an exclusive interview with AVIATION WEEK:

• **Land-based tactical air is losing mobility.** Its role is becoming "more and more constricted." Heavier, faster, electronic-equipped planes require elaborate takeoff installations; they're difficult to operate from make-shift fields of World War II. This could mean increasing use of the carrier as the takeoff site for tactical air.

• **Strategic bombing's days are not numbered.** Development of guided missiles and pilotless aircraft "could tend to reduce" the role of the strategic bomber in about ten years. On the other hand, complementary use of piloted and pilotless aircraft could add to the role of strategic bombing.

• **Atomic artillery is not likely to replace tactical air support for ground operations.** Army's Chief of Staff, Gen. Lawton Collins, thinks it might.

Sherman says atomic artillery and projectiles will probably be fired from planes in advance tactical air operations, and from the ground in close-in operations.

• **Lighter-than-air is not likely to be used by the military** for transport, unless and until it proves itself commercially. In a few "special cases," Navy does utilize its airships for transport work.

• **Battleships, the backbone of the pre-World War II Navy, now seem to be permanently relegated to their present military applications: shore bombardment, anti aircraft cover, headquarters for fleet commanders, at-sea training.**

Bigger Navy?

Adm. Sherman hints that before long he may bid for a bigger naval expansion.

Of the three services, Navy's build-up is markedly the most modest:

• The 1948 Forrestal defense program that preceded the Johnson "economy" regime called for a 12-division Army, a 70-group Air Force, a 24-carrier-group Navy of 10,700 operating planes.

• It is now planned to shoot Army strength up to 18 divisions and USAF strength to 95 wings this year. But Navy's build-up will be to 16 air carrier groups and 8,000 operating aircraft.

That's why there was some surprise when Sherman emerged at recent Senate hearings as the only completely satisfied member of the Joint Chiefs of Staff. USAF's Vandenberg, urged a much "faster and farther" air build-up. Army's Collins took a midde-road position: just a little more push, perhaps.

The key difference between the Sherman and Vandenberg positions seems to be "how fast" rather than "how far." Sherman clarifies his stand:

• **How Far?**—"I have never stated that I do not want a bigger Navy than now planned. I think that ought to be reviewed before long."

• **How Fast?**—"When I testified that 'certainly with respect to air the rate of build-up is as rapid as can be accomplished with efficiency,' I referred to the Naval as well as the Air Force program. And, by the statement, I did not prejudice myself against a 150- or 200-wing program the Air Force might present, nor against a larger Naval air arm."

Sherman summed up: "In our build-up I want to maintain quality and combat readiness while growing. Also, too-rapid military expansions always increase the hazard of maladministration and scandals.

Why Navy Gets Less Money

The postwar trend toward giving Navy a smaller and smaller slice of the defense budget doesn't mean the Navy is becoming, comparatively, a weaker and weaker arm of the defense, Sherman maintains.

Navy, which used to get a 40-percent slice of the defense budget in the first postwar years, now gets only 25 percent.

Sherman's point: The Navy has been able to do more for less money than the other two services because:

• **It is using souped-up carriers.** When the Navy launches a new carrier construction program, the money trend will change. Ships are the big cost item in Navy budgets.

• **Navy has put emphasis on strengthening its reserve forces**—which cost less to maintain than full-time active forces. Army and USAF have been handicapped on this score because they do not have the direct control over reserve components the Navy does.

That 'Pearl Harbor' Fleet

Navy, it seems to observers, was putting on its "poor" front last October when it knocked on Congress' door and asked blessing for construction of the new 57,000-ton carrier, to be called the Forrestal.

Sherman compared a 5,491-plane Naval arm now programmed with a 5,243-plane "Pearl Harbor" arm. Congressmen promptly demanded the Forrestal's construction to reinforce the "withering Naval air arm."

But it appears the 5,243 count included every plane in the Navy on Pearl Harbor day—from "grasshopper" types on up. The current program involves 5,491 "first-line" operating aircraft—exclusive of a strong reserve force.

Sherman suggests: It would be more accurate to compare the 5,243-plane "Pearl Harbor" force with 13,000 total aircraft inventory of today's Navy.

Here and There

• **National Security Resources Board**—NSRB is being revitalized. But it will be strictly an advisory agency, weighing problems and policies from the long-range perspective for use by Defense and other government operating departments and agencies in drawing up their shorter-range programs. The President wants W. Averell Harriman, now foreign affairs advisor, to take over the NSRB chairmanship. Jack Gorrie, now acting chairman, isn't likely to be named. He lacks strong political support.

• **Navy Plants**—BuAer will have around $400 million more to spend on its facilities expansion program as soon as the budget for the 1952 fiscal year, which starts July 1, is approved.

—**Katherine Johnsen**

AVIATION WEEK

VOL. 54, NO. 25

JUNE 18, 1951

Vandenberg

Twining

Vandenberg Expected to Step Out Soon

Twining seen as likely successor; other command changes hint at policy shift.

Reports that Gen. Hoyt S. Vandenberg, 52, will resign June 30 as USAF Chief of Staff were increasing in Washington last week. Several reliable sources informed AVIATION WEEK that his retirement was imminent, although close associates of the general professed to have no knowledge of it.

Vandenberg himself was in Paris and could not be reached. He was attending a meeting of chiefs of staff of the North Atlantic Treaty countries. But the conjecture was that the principal reason for his retirement at this time would be an offer from private industry.

Possibility of sweeping policy changes in basic air combat planning is foreseen in some quarters.

▶ **Two Likely Candidates**—Gen. Nathan Forrest Twining, 53, now Vice Chief of Staff, USAF, and Lt. Gen. Lauris Norstad, 44, Chief of Staff, U. S. Air Force in Europe, and commander of Allied Air Force, Central Europe, are regarded as most likely candidates for successor to the top Air Force post. Twining has the better chance, some reports say, because Gen. Eisenhower wants to keep Norstad in his present spot.

Twining, fourth-ranking Air Force officer in seniority, formerly was commander of the Alaskan Combined Defense Command, commanding general of the Air Materiel Command and is now Vice Chief of Staff. During World War II he was named commander of aircraft in the Solomons (Pacific) and later became commanding general of the 15th Air Force in 1944. Some quarters believe his succession to Vandenberg would be logical as a last tour of duty before retirement. He has put in 33 years of active service—three years longer than is needed for full retirement pay.

Norstad, at 44, is considered to be one of the most brilliant air tacticians and strategists this nation has produced and is obviously being groomed to assume the office of Chief of Staff. But, last year, when the post of Vice Chief of Staff became vacant with the death of General Muir S. Fairchild, Norstad, although he was prominently mentioned for the job, was passed over after a brief term as Acting Vice Chief because of his lack of executive administrative experience.

▶ **Retirement Speculation**—Considerable speculation that Vandenberg would retire has arisen because of recent remarks made by him. He said that while his tour of duty as Chief of Staff would be completed in April 1952, he still needed two more years service to be eligible for full retirement. Sources close to Vandenberg recently disclosed that he had been offered many attractive executive positions in private industry but that he would give consideration to none until the retirement date was crystallized. One source also indicated that Vandenberg would retire soon (AVIATION WEEK June 4).

Norstad

Top civilian Air Force officials are particularly disturbed because of imminent retirements of many other top ranking USAF officers during the next 18 months. Many are reaching retirement age almost simultaneously due to the fact that all entered service with Signal Corps Aviation Section and later the Army Air Corps at about the same time

Going . . .

Wolfe

Coming . . .

Cook

during the period encompassing World War I.

The four ranking officers—all with four stars—Gen. Joseph T. McNarney, George Kenney, Hoyt S. Vandenberg and Nathan Twining each have approximately 30 years service. Gen McNarney, chairman of Department of Defense Management Committee is reported retiring Aug. 31 (AVIATION WEEK June 4), although it is denied in some quarters. These sources declare that McNarney is being requested to remain on active duty another year by Secretary of Defense Marshall.

▶**Young Replacements**—Most disturbing to the civilian secretariat of the Air Force is the fact that nearly all of their military counterparts, most of whom have been responsible for establishing and promoting the present strategic air force concept, are being replaced by a group of younger men reported favoring more emphasis on tactical and fighter aviation and a de-emphasis of the strategic concept.

There has been an almost continuous battle between bomber and fighter supporters for control of Air Force ever since its first beginnings in the Signal Corps Aviation Section. According to top Pentagon sources the prestige of the promoters of the theory of high-altitude employment of big bombers reached a peak during World War II in Europe and then suffered during the battle of the Pacific when high-altitude bombing in many instances proved ineffective.

But by the end of World War II, the advent of the really big B-36 bomber helped establish among the general public and Congress the Air Force conviction that the long-range strategic air arm could hold off all comers. By 1947, American air power was building to back the big intercontinental bombers as the last word.

War in Korea was decried in some top Air Force quarters in its early stage as only a "riot in the ball park." They say it showed the fallacy of over-emphasizing the long-range strategic arm. It thus far has had little effective use in the present conflict.

▶**B-47 Advanced**—Today, struggling to hold the balance of control of Air Force policy planning, the bomber proponents are selling the idea of the lighter, swifter, jet-engined B-47 as the real power around which the strategic air arm will be knit. Subtly changing is the "old" idea that the B-36 is prime deterrent for war. Instead it is: "Of course we still need the heavies like the B-36, the coming jet-powered B-52 and the sweptwing B-36 for long-range missions but what we really need are the shorter-range, fast, medium, jet bombers. These bombers can perform almost like fighter planes, anyway." By stressing the fighter-like qualities of the bombers these Air Force generals hoped to win the support of the fighter and tactical advocates.

A report of pending retirement last month of Lt. Gen. K. B. Wolfe, USAF Deputy Chief of Staff for Materiel, was emphatically denied by that officer's own executive who also stated that his superior was committed to several programs at least until October. Nevertheless, the official announcement of Wolfe's retirement followed within the month.

Sources close to General Wolfe reported that he bitterly opposed the report of the Riddenhour Committee, of which retired Gen. James H. Doolittle was a member, which proposed separation of research and development from procurement. Both agencies were formerly under jurisdiction of Air Materiel Command.

The Riddenhour group's recommendation declared in part "control of Research and Development affairs by a single agency is urgently needed to end confusion brought about by scattered responsibility." Shortly thereafter the Research and Development Command was established with co-equal status with Air Materiel Command. Subsequently Wolfe requested retirement.

▶**Kenney Retiring**—Second senior airman, General George C. Kenney, Commandant of the Air University, Maxwell AFB, Ala., will retire Aug. 31. He will be replaced in that command by Lt. Gen. Idwal Edwards on Aug. 1. Edwards is currently Deputy Chief of Staff for Operations.

Maj. Gen. Thomas D. White, currently director of Plans in the Office of Deputy Chief of Staff, Operations, will fill the vacancy left by the reassignment of Gen. Edwards.

Maj. Gen. Orval R. Cook, Director, Procurement and Industrial Planning, AMC, is slated to replace Lt. Gen. K. B. Wolfe as Deputy Chief of Staff, Materiel.

In another top-level command switch brought about by the pending retirement of Maj. Gen. Gordon P. Saville, Maj. Gen. Donald L. Putt steps in as Saville's successor in the post of Deputy Chief of Staff, Development. He is named to that post only temporarily, however, and is designated "acting deputy."

Former post held by Gen. Putt was that of Director of Research and Development, Directorate Research and Development.

Maj. Gen. Robert W. Burns, formerly Vice Commander of Air Training Command, has been named Assistant Deputy Chief of Staff, Operations, replacing Maj. Gen. Frank F. Everest, who recently was named commanding General, 5th Air Force, Far East Air Force.

Maj. Gen. Joseph Smith, who has been Deputy Director of Plans, Deputy Chief of Staff, Operations, will become Director of Plans, Deputy Chief of Staff, Operations, replacing Gen. White.

Maj. Gen. Robert M. Lee, Commander, Air Task Group 3-4, Joint Chiefs of Staff, will become Deputy Director of Plans, working under Gen. Smith.

Brig. Gen. Mark E. Bradley, Jr., a deputy under Gen. Cook at Air Materiel Command, will be acting Director of Procurement and Industrial Planning, Air Materiel Command.

Other assignments resulting from top-level changes will follow during the next 60 days. These changes, one AF spokesman declared, will materially affect overall United States Air Force air power theory.

Mass F-84 Crashes Traced to Inlet Icing

Icing conditions in Allison jet-engine inlet screens caused by localized atmospheric conditions were blamed last week by USAF investigators for the mass crash of eight Republic F-84 jet fighters near Richmond, Ind., on June 8.

A special board headed by Maj. Gen. Victor E. Bertrandias, USAF Director of Flight Safety, and Dr. Sverre Pettersen, well-known meteorological scientist, reported:

"It is the opinion of the investigative board at this time that the primary cause factor of the F-84 accidents was engine-inlet screen icing due to a peculiar set of localized atmospheric conditions. To date, the investigation has revealed no indication of sabotage."

All eight planes crashed within a 13-mile radius in eastern Indiana.

▶ **Inlet Screens Fouled**—Investigation of the first three F-84s to crash, AVIATION WEEK learned, showed that all three had had their inlet screens fouled with ice in virtually identical manner.

It was understood that the Allison J-35-A-17 engines with which the airplanes were powered take in about five times the volume of air required for combustion, the additional volume being used for cooling.

An automatic fuel control on the engine feeds in additional fuel as soon as the rpm. drops. The additional fuel plus the lack of cooling put the engines up over temperature limits within 5 seconds after the inlets were clogged, it was estimated, with resultant "throwing" of blades and major failure of the turbine components.

▶ **Icing Problem**—Phenomenon of jet-intake icing has long been a problem to researchers at NACA's Lewis Laboratory and at jet-engine manufacturing plants.

Some of the newer jet engines have been fitted with automatically retractable screens. Next production series of Allison J-35 engines—the J-35-A-33s already in production—will have retractable screens. The new high-powered J-35-A-23 engines, which are continuing in advanced development after the temporary cutback of Allison production orders, also have retractable screens.

The investigating board reported further: "As a precautionary measure a group of technical experts is conducting an inspection of all other aircraft involved in the formation on a round-the-clock inspection to determine any effects that may have been incurred to the powerplant section by reason of their flying through the same area. Fourteen aircraft at Selfridge Field (home base of the eight crashed planes) have been inspected and have revealed no signs of visible damage and are ready for flight."

▶ **Part of Formation**—The crashed planes were part of a formation of 37 F-84s headed for Selfridge AFB, Mich., after remaining overnight at Wright-Patterson AFB, Ohio. Their home station was Bergstrom AFB, Tex. Three planes crash-landed without serious injury to pilots, two pilots bailed out, the other three pilots died in the crashes.

Investigation board included agents of FBI and USAF's Office of Special Investigations, specialists and technicians from Republic and Allison, and AMC and SAC engineering and maintenance and operations specialists.

Details of the local atmospheric conditions believed to have caused the icing phenomenon have not been disclosed. It is understood, however, that all the crashed aircraft flew through a dense cloud bank about the time of the accident and that there was considerable thunderstorm and turbulence there.

INLET PORT for refueling (arrow) will be standard on F-84Gs now in production.

New F-84 Fitted for Air Refueling

Another Republic F-84 Thunderjet made its debut last week.

This one is the F-84G, the first operational jet fighter equipped for mid-air refueling to come off the production line.

It will use the Boeing-developed flying-boom method for taking on fuel to increase its range or battle-time effectiveness. An operator in the tanker plane will pay out a control-surface-fitted telescoping boom to the fighter plane's receiver receptacle near the root on the upper serface of the wing leading edge. Connection of the boom to the receiver gives automatic fuel transfer at a rate of several hundred gallons per minute. Refueling operation will require about 2½ min., and all tanks—fuselage and tip—will be serviced.

The receiver nozzle on the jet is normally covered by a pair of flush doors. Flight tests of the installation were tried out on an F-84E to see whether the considerable hole around the nozzle in the fuel-takeon position might introduce buffeting or roll-off, and trials were satisfactory.

▶ **New Engine**—Aerodynamically, the F-84G essentially is a rubber-stamp version of the straight-wing E. But it will have faster climb because of increased power in its new engine—reported to be the Allison J-35-A-29.

Republic does not reveal the designation of the engine but says that the "improved powerplant" delivers 5,600-lb. thrust—10 percent more than that available in other F-84s. This, of course, does not include the sweptwing F-84F, which has been flying experimentally with an Armstrong Siddeley 7220-lb.-thrust Sapphire.

Republic also says that additional thrust has been obtained through refinement of the exhaust system.

The 5,600-lb. rating is probably a static figure (which winds up in the air with a somewhat lesser value) that doesn't add too much—perhaps a couple of miles per hour—to level flight high speed. This is because limiting high speed begins to occur when the drag rise due to compressibility sets in and the drag curve rises so steeply at this condition that no appreciable boost in speed is obtained with an increase of a couple of hundred pounds of thrust.

But the improved climb performance from the additional thrust will be an important operational factor.

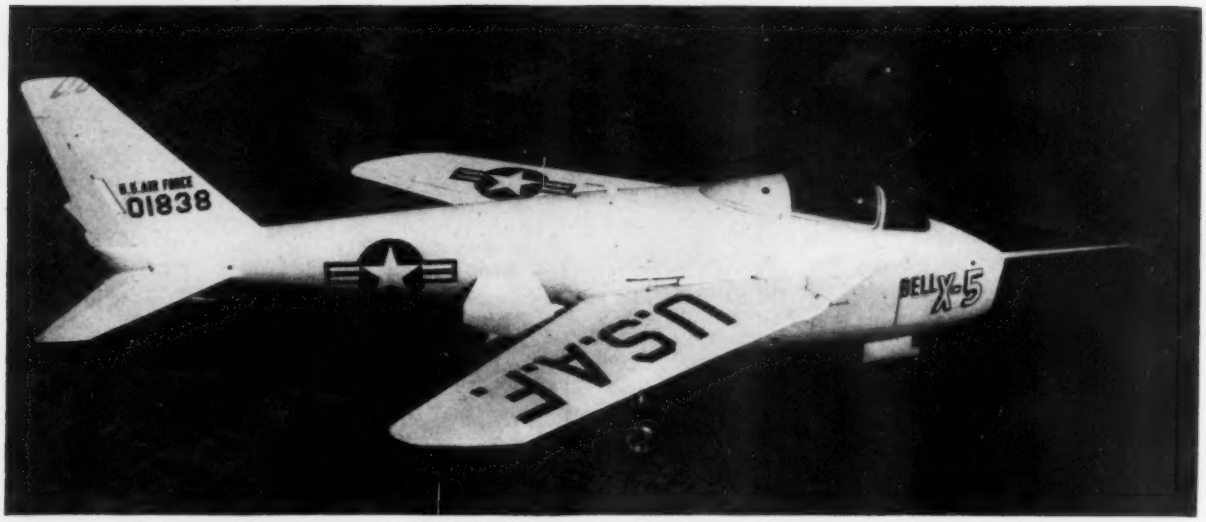
▶ **More Changes**—Another change evidenced in the G is reinforcement of the canopy with lateral and longitudinal metal strips for the transparent section. This should promote greater structural strength in the bubble.

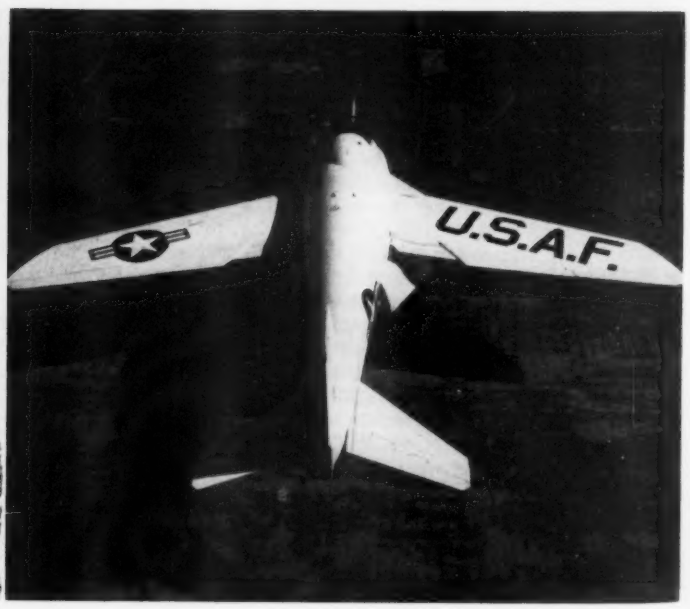
The G is also fitted with an automatic pilot—first of the Thunderjets to carry this equipment.

Servicing features are also improved, with access doors for all pilot servo mechanisms.

A few of the Gs already have rolled off the line. Gradually, their production will replace that for the Es.

Plane Whose Wings Change Sweep in Air:





New Bell X-5

Bell's X-5 research aircraft, designed to explore the effects of sweptwing configurations in transonic flight, will enter the first phase of its flight test program soon at Edwards AFB, Muroc, Calif.

Unusual feature of the X-5 is its wing design, an arrangement permitting the sweep angle to be varied in flight.

The design of the X-5 represents three years of research and development by the team of Air Force, Bell Aircraft Corp., and the National Advisory Committee for Aeronautics.

▶**Dimensional Data**—The size of the X-5 puts it in the same class with Bell's X-1, rocket-powered research craft. The X-5 has a wingspan of 32 ft. 9 in. (presumably in the fully-spread position). Length is 33 ft. 4 in., and height to tip of fin is 12 ft. Gross weight is given as approximately 10,000 lb.

Powerplant of the X-5 is the Allison J-35-A-17 axial-flow turbojet, rated at 4,900 lb. sea level static thrust.

Basic layout of the X-5 calls to mind several research aircraft proposals made by Messerschmitt, in Germany, during the early months of 1945. One, the P. 1101, had wings that were variable on the ground but not in flight. The X-5 mounts the engine in the fuselage belly; in this manner, inlet duct losses can be minimized because of the short length the air must travel to get to the engine intake.

The pilot sits high and forward; fuel is located behind him above the engine. Space is provided between fuel and engine to house the inboard root section of the wing when the sweep angle is at its greatest value.

▶**Wing Details**—The wing of the X-5 is pivoted about a vertical axis at intersection of fuselage and wing root. The inboard portion of the leading edge has been built in the form of a circular arc; it slides inside a fairing fixed to the fuselage. (See bottom photos.)

The trailing-edge inboard section of the wing is also formed in an arc; aft of this arc section is what appears to be a flap. Aileron chord is narrow; span is about 50 percent of the wingspan. Slats are fitted to the leading edge of the wing.

Conventional, sweptback tail surfaces are mounted on a boom extension of the main fuselage. A small ventral fin is fitted to the underside of the fuselage boom.

Landing gear of the X-5 is tricycle, with main gear of narrow tread. Main wheel leg is straight and retracts upwards and aft into the fuselage.

Dive brakes are mounted on the fuselage forward of the cockpit. They can be opened hydraulically until nearly perpendicular to the fuselage side.

GE Reveals More Powerful J-47s

A new version of the J-47 jet engine, the J-47-GE-21, has added greatly increased thrust without increasing the engine's dimensions, General Electric Co. announced last week.

GE used the long-standing phrase "in excess of 5,200-lb. thrust" to describe the engine's rating, although that thrust rating has long since been made obsolete by military demands. And, while the engine is probably as powerful as any now being produced, GE refrained from echoing "most powerful in production" claims made for other engines.

▶**Thrust Hint**—What GE did say gives some hint of what the engine will do:

- ". . . it puts out far more thrust than the present J-47. . . ."
- ". . . same frame size of the J-47 but with a thrust output so much greater that it isn't even in the same class."

About 6,500-lb. thrust (unaugmented) generally has been attributed to the 21's predecessor, the J-47-GE-23. In the light of engine development and GE's know-how this could easily be interpreted as a conservative value, for the 23 is a comparatively recent powerplant, having made its debut only last November.

Using this approach as a base for further interpretation in the light of the strong assertions made for the new engine by GE, a company that is usually exceptionally conservative in its claims, the new engine probably is up in that "most powerful" bracket—the 8,500-9,500-lb.-thrust class.

▶**Compressor Vital Factor**—And there is another point to go by. GE has bestowed its highest employe honor—the Coffin Award—on the Aircraft Gas Turbine division's Russell Hall and William Cornell for development of the new engine's compressor. GE doesn't toss this award around lightly, hence the efficiency of the 21's compressor must represent a significant step for attaining higher thrust.

The compressor is described as combing high air flow, high pressure ratio and high efficiency with a minimum number of stages. The 21's basic size remains the same as the previous J-47—36.75 in. in diameter and 146 in. long. Some of the accessories that formerly were housed in the nose have been placed underneath the 21 to provide a greater inlet area to the compressor.

This obviously reduces the nose diameter and increases the length of the inlet guide vanes by what appears from photos to be a significant increase over those on the 23.

▶**Other Details**—The new engine incorporates a cannular type of combustion system in contrast to the individual cans of the earlier J-47s.

Basic engine control system remains hydraulic, exhaust temperature is controlled electrically, and the oil is cooled by engine fuel. There is the usual "hot nose" and retractable air inlet screen.

GE reports the engine to have a "low" rate of fuel consumption.

▶**Model Changes**—It is now established that the J-47 is scheduled to be in the picture for some time to come and will be subjected to continuing development, for the company says that its new 21 is the first of its "advanced J-47" series. Chances are that the J-47 tag for the new 21 is merely a convenient label. The engine probably incorporates such extensive refinement and design improvements that it represents an essentially different powerplant.

With modification of accessory

mountings and other minor changes, the 21 will become the 29. With an afterburner it will be designated the 31.

▶ **XJ-53**—At long last in its announcement on the J-47, GE has admitted the existence of the XJ-53. AVIATION WEEK revealed the designation of this powerplant first in its Dec. 4, 1950, issue, together with an estimate of its power potential—12,000- to 15,000-lb. thrust.

Subsidy Separation Bill Introduced

A bill to separate air mail pay from subsidy, the product of two years' study by Senate Interstate and Foreign Commerce Committee, was introduced in Congress last week by the committee's chairman, Sen. Edwin Johnson.

The measure sets mail pay rates for various categories of carriers. Over and above this, it authorizes direct subsidies to airlines, principally to pay them for uneconomical service to small communities if service is in the public interest.

Johnson simultaneously released two voluminous analytical reports by the New York accounting firm, Ernst and Ernst, developing methods and allocations to show how much various communities are subsidized if they fail to furnish enough traffic for economic service.

The legislation sets these mail rates for a three-year period starting July 1, 1952:

- **For domestic trunk lines:** 42 cents a ton mile.
- **For "regional" carriers:** 63 cents a ton mile.
- **For "local service or feeder" carriers:** 84 cents a ton mile.
- **International air carriers:** 80 percent of the average postage revenue for transporting the mail.

The bill provides for a 100-lb. mail minimum allowable for rate computation on each leg of all mail schedules to cover standby expense which may be incurred.

▶ **Definite Rate Pattern**—As compared to the widely varied air mail rates in effect today, which in many cases combine subsidy with pay, the new scale proposed by Sen. Johnson would set a definite pattern for the first time in recent history. Under a sliding-scale arrangement in effect since early 1948, for example, the Big Four airlines were paid in 1950 as follows: an average of 59 cents a ton mile for American, 67 cents a ton mile for Eastern, 64 cents for TWA and 59 cents for United.

Had the new rates been in effect in 1949, Sen. Johnson stated, the Post Office Department would have saved $40.2 million in domestic payments. He pointed out that the domestic airlines have asked CAB to approve an additional $29 million in mail pay for 1949, over and above the $60.5 million already paid them. If this additional payment is granted, the savings under the new legislations would have totaled nearly $70 million.

"For the purpose of maintaining and continuing the development of air transportation—including the introduction of new and improved types of commercial aircraft—to the extent and of the character and quality required" for national defense and commercial interests, the legislation empowers Civil Aeronautics Board to grant direct subsidies to the carriers upon petition. Petitions of domestic carriers would lay out the portion of the payment sought that is allocable as subsidies to communities for uneconomic public-interest service.

▶ **Studies Incomplete**—Pointing out that studies on international mail rates and subsidies by his committee and air coordinating committee are not yet completed, Johnson said that to meet "the demand" for separation for overseas service, as well as domestic service, he had provided a method of relieving the Post Office Department from the burden of supporting the international lines, too. They would also be eligible for direct subsidy grants by CAB under the measure.

Johnson estimated the 80-percent-of-revenue rate would be in the neighborhood of $1.51 per ton mile—substantially below the Universal Postal Union rate of $2.86. The measure would bar the Post Office from transporting mail by foreign carriers at the higher rate.

Beech Trainer Wins AF Competition

Air Force has notified Beech Aircraft Corp., Wichita, that it is the winner in a competition for development of a new type Air Force twin-engine pilot trainer. It was understood that the Beech development program on the new plane will be followed by a large production contract. Some sources said combined production and development contracts would amount to $100 million for Beech. The complete trainer project is reported to total around $200 million, indicating that there may be an additional source.

Meanwhile the USAF disclosed to AVIATION WEEK last week that it had issued procurement authorizations for 23 other airplanes and two jet engines to 17 aircraft contractors and one engine company in the period from Mar. 1 to June 8.

Examination of the Air Force procurement authorizations listed here indicates that USAF procurement is settling down into grooves for additional orders of established planes and that only a few orders are for new models.

▶ **The Planes**—These are the planes:

- **North American F-86H,** which is understood to be the next production version of the F-86 jet fighter following the currently produced F-86E and F-86F (the same as the E except for its production assignment at North American's Columbus plant). Presumably the F-86H will be a faster plane than the current speedy Sabres, utilizing one of the new higher-powered jet engines which are now in final development stage.
- Republic F-84F and F-84G. (See accompanying story on F-84G on p. 15.)
- Piasecki H-21 and HUP-2 helicopters.
- Sikorsky H-19 helicopter.
- Grumman SA-16 rescue amphibian.
- Fairchild (Chicago) C-119 cargo transport.
- Chase (Willow Run) C-123 assault transport.
- Lockheed (Marietta) B-47 jet bomber.
- Boeing (Wichita) B-47.
- Northrop F-89D, new version of the two-seater twin-jet night fighter.
- Convair (Ft. Worth) RB-36 reconnaissance bomber.
- Lockheed (Burbank) F-94C fighter and T-33 and TO-2 jet trainers.
- Bell H-13D helicopter.
- Canadian Commercial Corp. L-20 Beaver liaison plane.
- Canadian Car and Foundry T-6G trainer.
- American Helicopter Co., single-seat jet copter.
- Cessna Aircraft Corp. L-19 liaison plane.
- Piper Aircraft L-18C and L-21 liaison planes.

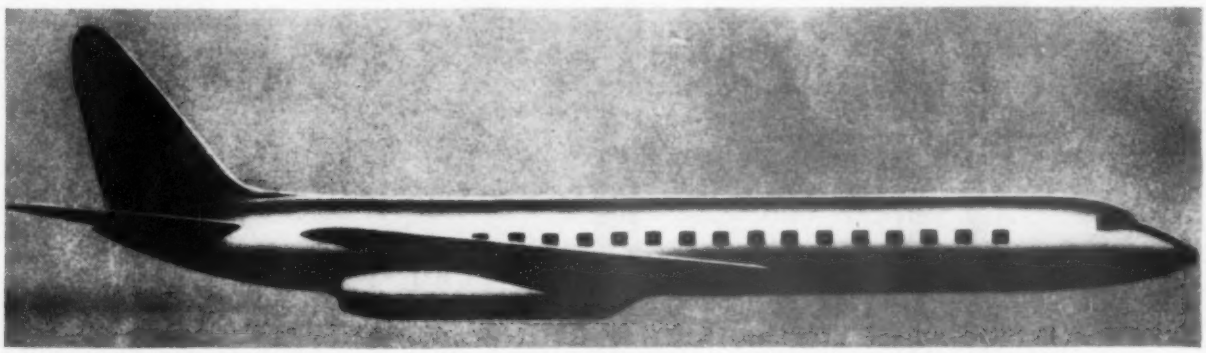
▶ **The Engines**—Engine procurement authorization went to Allison division, General Motors Corp., for J-33 and J-35 jet engines. It is probable that these are for the J-35-A-33 and the J-33-A-35 engines.

There is speculation that part of the production order for the trainers may go to Canadair, as a Beech licensee because of plant availability.

While Beech now is employing only about 6,000 persons at Wichita, as compared with about 16,000 at World War II peak, it is understood that USAF does not wish to establish another large employer in the Wichita area to compete with the high-priority Boeing-Wichita B-47 program.

The new Beech trainer, it is understood, will be powered with large piston engines, possibly as large as Pratt & Whitney R-2800s, and will have a cockpit for four, in addition to a small passenger compartment, which will carry about 12 persons. After first priority for trainer production is satisfied, it is considered likely that additional planes will be provided for executive transport.

BOEING MODEL 473 not only draws heavily on the B-47 for design, but will profit from performance experience with the bomber.



LOCKHEED L-193 design similarly stems from that company's F-90 interceptor, and is a sealed-up version (see page 24).

First Details on U. S. Jet Transport Plans

Outlook brighter for construction of planes as military shows signs of renewed interest in development.

Two promising U. S. jet transport design proposals by Boeing and Lockheed are waiting on the shelf for customers, subject to U. S. military approval.

Meanwhile, the British lead in jet transport development is stretching out, with at least three of the de Havilland Comet four-jet planes already in the air and six scheduled to be in regular airline operation on British Overseas Airways Corp. routes by next September.

Failure of higher U. S. government or industry leadership to surmount the hurdles of great development costs for jet transport prototypes has delayed start of any "metal-cutting" for commercial jet transports in U. S. aircraft plants. First and only U. S. jet-powered transport to fly has been the modified four-jet Chase C-123 military assault craft, which has also been flown as a piston-engine plane and as a glider.

Compounding earlier delaying difficulties has been the recent restriction of aircraft materials to essential military uses to a point where the only hope of a U. S. jet transport prototype now rests with the Department of Defense.

▶ **Chances Better**—AVIATION WEEK has learned, however, that chances for such military sponsorship are better than they were a few months ago, when it was decided that jet passenger transports should be shoved far down the list of prototypes to be developed.

At the insistence of some U. S. airframe manufacturers and some airlines concerned about the looming threat of British competition, new consideration is now being given by the USAF Senior Officers' Board to a U. S. jet transport military development program.

▶ **Lessons Learned**—U. S. jet transport development has not been entirely neglected, however. Considerable research knowledge for such transports is being gained from various military jet configurations.

For example, the Lockheed four-jet L-193 transport proposal, recently shelved because of military commitments, is in configuration a scaled up version of its sweptwing F-90 penetration fighter.

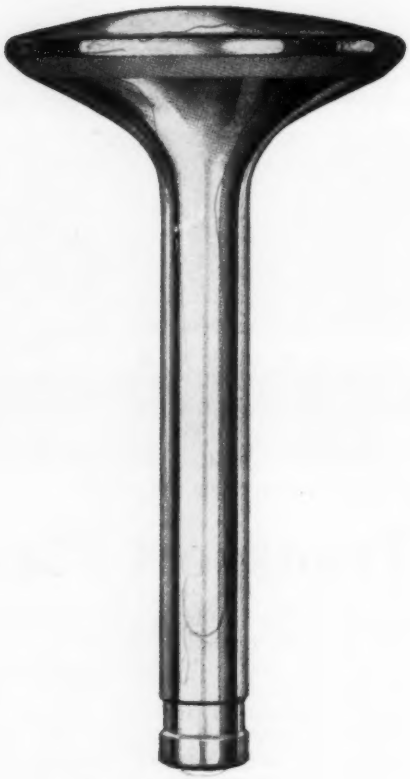
Similar research into design performance of the proposed four-jet Boeing Model 473 is being obtained through actual flight experience of the Boeing strategic six-jet B-47 bomber.

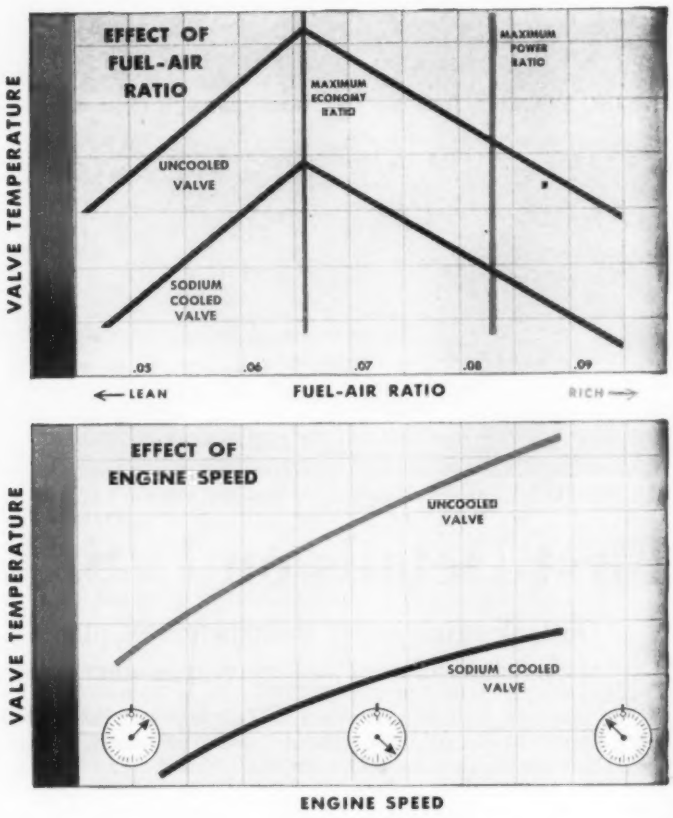
▶ **Design Comparison**—The Lockheed design calls for a 64-passenger domestic version or a 48-passenger luxury over-

Why Sodium Cooled Valves?

The trend of modern engines is to operate at higher speed and more economical fuel-air ratio. In considering factors which influence exhaust valve life, temperature is the dominant one. High temperatures sharply reduce the resistance to corrosion, distortion, and fatigue life of the finest alloy steel. The effectiveness of sodium cooling in reducing valve temperatures is shown by the curves below, which are typical of recorded test data.

The curve "Effect of Fuel-Air Ratio" shows that as the mixture is leaned out to obtain maximum economy, valve temperatures rise. The curve showing "Effect of Engine Speed" indicates that temperature rises quite rapidly as speed increases.

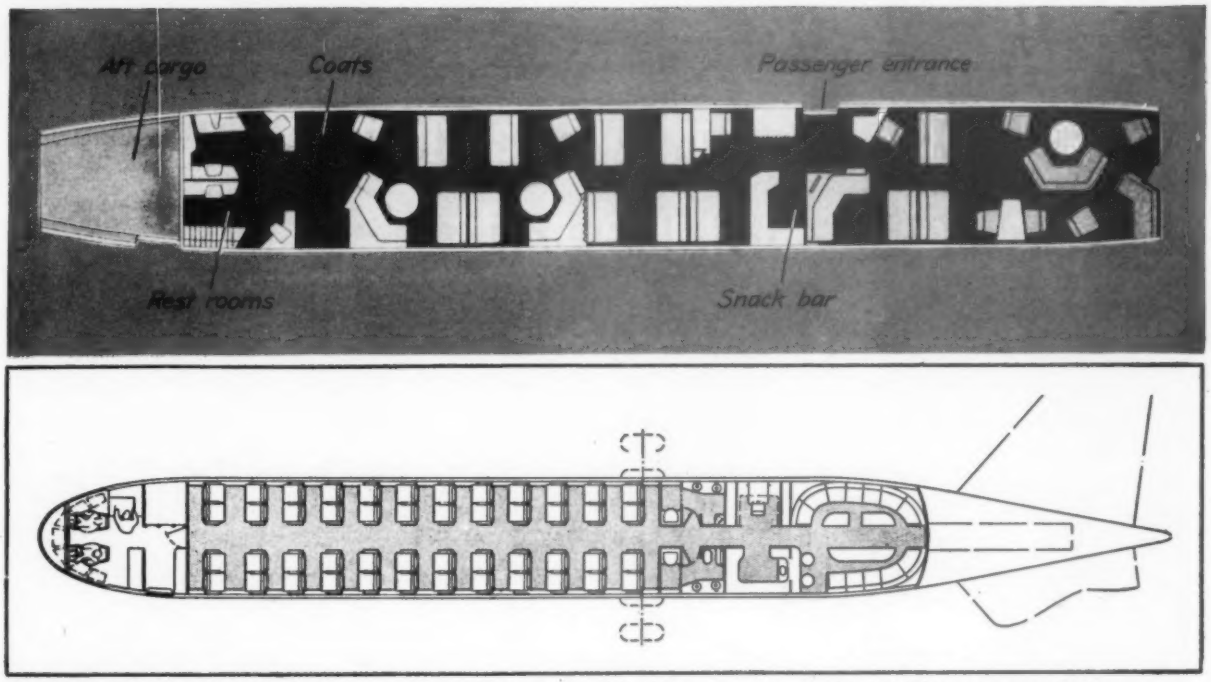




EATON
MANUFACTURING COMPANY
General Offices: CLEVELAND, OHIO

Eaton engineers will welcome an opportunity to discuss the application of Eaton sodium cooled valves to engines proposed or now in design.

VALVE DIVISION • 9771 FRENCH ROAD • DETROIT 13, MICHIGAN



LUXURY ALOFT is the keynote of these versions of the Lockheed L-193 (top) and Boeing Model 473 jet transport designs.

seas version which will cruise at 582 mph. at 35,000 ft.

This compares with Boeing quotations of 500-mph. cruising speed at 40,000 ft. or 580-mph. maximum speed with normal-rated power and 125,000-lb. gross at 40,000 ft. The Boeing design includes three versions: a high-density 97 passenger cabin with five abreast seating, and two standard and luxury versions for 60-passengers. The luxury version includes an elaborate furnishing of the rear compartment as a lounge. Such an arrangement would be used for overseas flights, for example, from San Francisco to Hawaii.

▶ **Power Plants**—Both Boeing and Lockheed design proposals specify far more powerful turbojet engines than are now in operation. But several of the newer jet engines now in development (Pratt and Whitney J-57, Allison J-35-A-23 Westinghouse J-40) give promise of the 10,000 lb. thrust needed to achieve the performances calculated for the Models 473 and L-193.

Actually, the Boeing proposal calls for four 9,250-lb. static thrust engines slung two in a pod under either wing, similar to the B-47 installation now in use.

And the Lockheed proposal has stepped up its power requirements even higher, calling for four jet engines with static sea level thrust of 12,200 lb. each. These are installed in a cluster at the rear of the fuselage, aft of the passenger cabin.

▶ **Runway Room**—Landing requirements for both planes are obviously aimed at using existing airports, although the 140-ft. 2-in. span Boeing is expected to show considerably shorter takeoff at 135,000 lb. gross than does the 104-ft. span Lockheed at 148,000-lb. gross, as could be anticipated. The Boeing gets up in 3,950 ft. (dry) on a standard day, but the Lockheed requires 5,050 ft. without afterburner, on a standard day. On hot-day takeoffs, the Lockheed is expected to get off in 5,500 ft. with afterburners.

▶ **Safety Features**—Careful attention to safety features has been given by the designers of both new planes.

Boeing cites safety features such as these: low wing configuration with all fuel carried in outer wing panels; pod engine installations. Double pane windows, wide aisles for ease of passenger movement, eight emergency exits; front or rear loading, and tricycle gear, with dual wheels throughout. (Same size and type of tire is used as for current transports.)

Lockheed lists among safety features of the L-193: engine-out maneuverability due to central location of engines; power-boost controls; thermal de-icing in leading edges of wing and tail; engines compartmented with fire resistant materials; all fuel carried in wing and center section tanks, none in fuselage; (Wingtip tanks will be added for very long-range fuel requirements.)

▶ **Maintenance Simplified**—Simplicity of the jet engine as compared to the piston engine, has long been a selling point for a switch to the turbines. Both American manufacturers have taken full advantage of this simplification in their new designs, and have tailored them for easy maintenance in all particulars.

Lockheed enumerates such trouble-free maintenance items as: engine accessibility, with four powerplants side-by-side, under aft fuselage floor with hydraulic and electrical systems easily reached, short intake ducts; engines compartmented separately for easy removal; simple fuel system and controls connections, reachable from ground level by maintenance personnel; engine controls run from cockpit direct to engines, with no turns into wings and engine nacelles.

Also, underwing refueling to four groups of tanks of approximately equal capacity, pressurized with engine air to prevent fuel loss; bladder-type inner wing tanks, and integral outer wing-tanks.

Boeing features easily accessible jet pod engines, which can be quickly changed if necessary, general design for equipment accessibility, underwing refueling, ground level accessibility, no combustion heaters, roomy cargo compartments.

▶ **Passenger Comfort**—One of the important things that both manufacturers have to sell in their new jet transport designs is passenger comfort. The greatly reduced level of vibration in jet aircraft as compared to piston-engine propeller planes is a generally recognized fact. Lockheed claims an additional smoothness by its rearward fuselage engine installation "in one of the rigid areas" of the airplane, just aft of the wing carry-through structure.

Reduced cabin noise level is claimed as another advantage of the Lockheed

a complete aluminum fabricating service for airframe parts...

SAVES 30% SCRAP LOSS

COMPLETE ALUMINUM FABRICATION FACILITIES—During the war years, Reynolds Fabricating Service produced thousands of aluminum parts for aircraft manufacturers. Since that time, facilities have greatly expanded. One of the country's most complete facilities for aluminum fabrication includes more than 100 mechanical presses ranging from 5 to 1700 tons, hydraulic presses from 50 to 5000 tons, plus equipment for shearing, riveting, blanking, forming, stamping, welding and finishing.

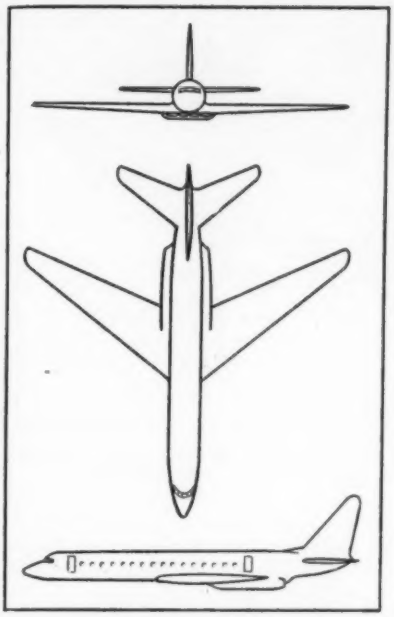
Reynolds Aluminum Fabrication Service offers extensive facilities to produce airframe parts in any stage of completion ranging from flat blanks to finished units ready for assembly. Every pound of aluminum which you buy in finished parts is completely usable . . . no scrap loss. You realize important savings in scrap handling, shipping, storage space, work space and manpower. In addition, there's no capital tie-up on scrap aluminum in transit and in inventory. Reduction of this idle aluminum will help relieve today's shortage.

Quotations on airframe parts can be furnished to your drawings and specifications. For complete information on how Reynolds Fabrication Service can help in your program, write for booklet, "Pounds of Parts Instead of Pounds of Metal". Or call the Reynolds office listed under "Aluminum" in your classified telephone directory. Reynolds Metals Company, Parts Division, 2059 South Ninth Street, Louisville, Ky.

REYNOLDS METALS

REYNOLDS ALUMINUM FABRICATING SERVICE

BLANKING • EMBOSSING • STAMPING • DRAWING • RIVETING • FORMING • ROLL SHAPING • TUBE BENDING • WELDING • FINISHING



LOCKHEED L-193

Characteristics

Powerplants
four 12,200-lb., sea level static-thrust turbojet engines
Wing area .....1,615 sq. ft.
Horizontal tail area.....
Vertical tail area.....
Overall length .....112 ft. 2 in.
Wing span .....104 ft.
Overall height.....36 ft. 8 in.
No. of passengers 48-64

Weights

Design takeoff gross weight
148,000 lb.
Design landing gross weight
113,000 lb.
Weight empty .....74,500 lb.
Operating weight empty...77,260 lb.
Useful load .....70,740 lb.
Payload
14,800 lb.-17,100 lb. (48-64 passengers)

Performance

Max cruising speed at 20,600 ft.
618 MPH.
Max cruising speed at 35,000 ft.
564 MPH.
Rate of climb S. L. (normal thrust) .....5,500 FPM.
CAR takeoff field length....5,050 ft.
CAR landing field length....4,980 ft.
Landing speed at max. landing weight .....120 MPH.

engine grouping which puts the exhaust of the four jet engines 11 ft. behind the rear of the passenger compartment.

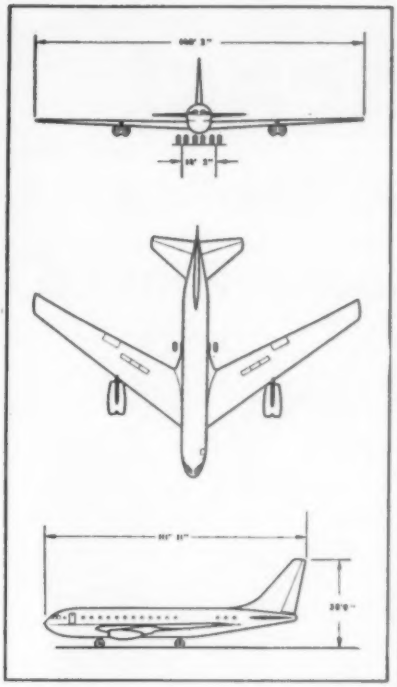
Other features of the Lockheed L-193:

• **Heat for wing and tail de-icing** is provided by compression of high pressure air used, plus booster heat from a tailpipe muff.

• **Cabin heat** is "hot wall" type warmed by hot air from the engines.

• Air tapped from engine compressor is carried under pressure to an air-driven refrigerator from it which feeds into cabin at proper pressure and temperature.

• **Air brakes, wing slats, and spoilers** are



BOEING 473

Characteristics

Powerplants
four 8,250-lb. sea level static thrust turbojet engines.
Wing area .....2,300 sq. ft.
Horizontal tail area.....518 sq. ft.
Vertical tail area.....330 sq. ft.
Overall length .....111 ft.-11 in.
Wing span .....140 ft.-2 in.
Overall height .....38 ft.19 in.
No. of passengers 60-97

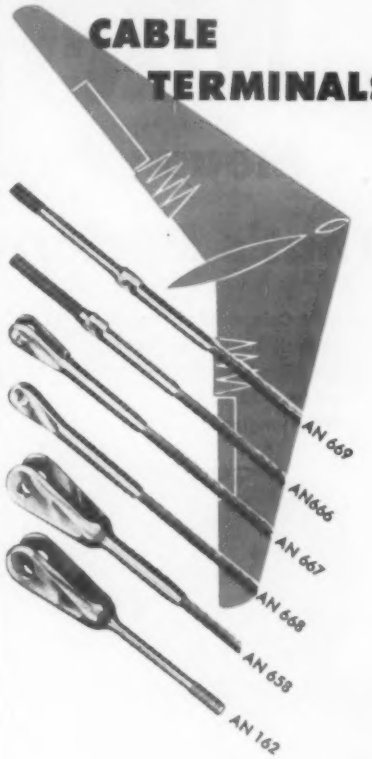
Weights

Design takeoff gross weight .....135,000 lb.
Design landing gross weight .....120,000 lb.
Weight empty .....77,780 lb.
Operating weight empty...80,030 lb.
Useful load .....57,220 lb.
Payload
16,000-23,000 lb. (60-97 passengers)

Performance

Max. speed, normal-rated power at gross weight of 125,000 lb. at 40,000 ft. altitude .....580 MPH
Cruise speed at 110% $V_{max.\ range}$ at gross weight of 125,000 lb. at 40,000-ft. altitude .....500 MPH
Rate of climb, S. L. at normal rated power .....3,600 FPM
CAR takeoff field length at S. L., gross weight—135,000 lb. (dry) 3,950 ft.
CAR takeoff field length at S. L., gross weight—135,000 lb. (wet) 2,850 ft.
CAR landing field length at gross weight—112,000 lb. (brakes only) 6,150 ft.
CAR landing field length at gross weight—112,000 lb. (brakes and chute) .....5,050 ft.
Stalling speed at landing weight of 112,000 lb. .....95 MPH.

HARTWELL
CABLE
TERMINALS



Hartwell stainless steel, swage-type cable terminals are manufactured to conform to all requirements of Army and Navy specifications. For over 10 years they have been continuously produced for the Aircraft Industry. Every operation in their manufacture is under rigid quality control resulting in an approved cable terminal for every application. We also design and manufacture special cable terminals to your drawings and specifications. A large inventory of all types and sizes is maintained to effect immediate delivery on your requirements.

Packaged Protection

- for thread protection
- for surface protection
- for ease in handling
- for quick inventory

HARTWELL
AVIATION SUPPLY COMPANY
9035 Venice Boulevard, Los Angeles 34, Calif.
Manufacturers of:
HARTWELL Flush Latches and Hinges
HARTWELL Aircraft Fittings.

Microcast®

Means Power Blading

That's Performance-Proved

G. N. Cole, chief of engine design at Pratt & Whitney Aircraft, specifies Microcast blades on the J-42 Turbo Wasp engine.

THE MICROCAST PROCESS of precision casting for aircraft engine power blading, performance-proved in World War II, offers outstanding advantages to design engineers working on today's revolutionary power units. Superior to conventional production methods, Microcastings afford substantial dollar and labor economies, plus savings in critical alloys and elimination of tool breakage. Microcastings virtually eliminate machining, freeing machine tools for other work. Why not investigate the Microcast Process today?

FREE BOOKLET

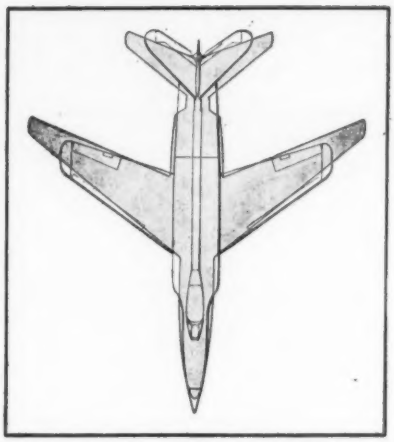
The precision process originated by Austenal Laboratories, Inc. for the production of castings of intricate design using the high melting point alloys where surface smoothness and dimensional uniformity are mandatory, requiring little or no machining. Write for literature and complete information.

MICROCAST PRECISION CASTINGS PROCESS

MICROCAST DIVISION
AUSTENAL LABORATORIES, INC.
224 East 39th St., New York 16, New York
715 East 69th Place, Chicago 37, Illinois

MICROCAST

MICROCAST TRADE MARK REG. U. S. PAT. OFF.



F-90 TO L-193: Transport outline (shaded) is superimposed on fighter sketch.

being considered as additional features for control at low speeds, for the Lockheed, along with the generally used slotted flaps.

• **Airplane has nose-down configuration** on the ground, raising the engine exhausts at the tail, so that the force of the jet blast would be dissipated, cutting down the restricted area behind the plane in runup to about 100 ft.

• **Passenger doors** are at present day transport heights; lower cargo compartment doors only five ft. above ground.

• **Safety margin provided** by the increased power is such that plane is expected to be able to fly at about 5,000 ft. altitude with three engines out.

Other features listed for the Boeing:

• **Integral rear-loading ramp** is provided.

• **Fully pressurized cargo** holds have 700 cu. ft. of usable volume and are easily accessible for hand loading from ground level.

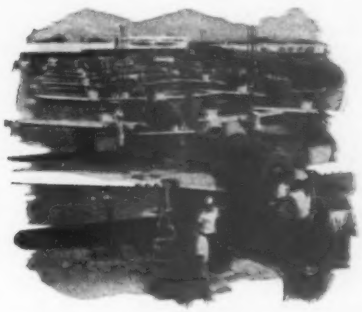
• **Standard 60 passenger cabin** is designed for modification to other interior arrangements without changes to basic airplane, structure. Conversion from standard to luxury arrangement involves simply refurnishing the aft compartment as a lounge, which can be accomplished at any time in the life of each plane. The 97-passenger high-density seating arrangement can be converted from the 60-passenger version merely by rearranging the seats to five abreast.

The Boeing and the Lockheed jet transport proposals are now only paper airplanes, unless the Department of Defense makes their further development possible. If development work were started on either prototype today, on a normal commercial timetable it is estimated it would be well over two years before the prototype would fly, and possibly another three years before the airplanes could be in transport service in production quantities. But the urgency of military aircraft production has a way of compressing long periods of development and testing.

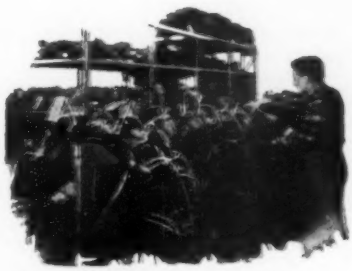
Commercial airliner, Air Force transport or private carrier; safety, efficiency and economy are vital factors.

ENGINE OVERHAUL *is one of PAC's major operations. We pull 'em down and put 'em back quickly and efficiently.*

AIRFRAME OVERHAUL *is another important PAC function. For example, a large number of F-51's and C-54's are in process at two of our six branch locations.*



MANUFACTURING *accounts for an ever increasing portion of total effort. PAC's pressurization systems for high altitude aircraft are standard equipment on many fighter and transport craft.*



PARTS DISTRIBUTION *for major parts manufacturers is handled by PAC throughout the world. Pratt & Whitney, for example, appointed PAC as their first parts distributor.*

THE STRUCTURE of Pacific Airmotive activity is composed of four basic divisions, Engine Overhaul, Airframe Overhaul, Manufacturing and Parts Distribution. Each division is under the supervision of, and operated by, the most highly skilled and experienced men. Twenty-year service is not unusual among PAC craftsmen. The rapid growth the entire PAC organization has shown during the past years proves that its services and facilities are highly regarded by the entire aircraft industry. Quality of PAC engine overhaul has repeatedly extended the time between overhauls... increasing efficiency and profits for many Pacific Airmotive clients.

And, of course, PAC is the first and largest distributor of Pratt & Whitney Engine parts in the world! Also, scores of other leading parts manufacturers are represented by Pacific Airmotive. PAC activity in the airframe overhaul field over a period of many years has resulted in facilities to handle aircraft from the smallest private ship to the large troop carriers. An example is the vast reconversion and modification program on F-51 fighters and C-54 military cargo carriers undertaken for the Air Force. PAC manufactured pressurization equipment is found as an integral part in 90% of all modern fighters and pressurized commercial transport craft.

★

It's great to work and live in sunny California. Engineers, and many categories of skilled aircraft workers are needed by PAC... drop us a line.

★ ENGINE OVERHAUL ★ AIRFRAME OVERHAUL
★ MANUFACTURING ★ PARTS & SUPPLIES

PAC

KEEPS 'EM FLYING

PACIFIC AIRMOTIVE CORPORATION

Executive Offices: **BURBANK, CALIFORNIA**

Other Divisions: Oakland and Chino, Calif. • Seattle, Washington Kansas City, Kansas • Linden, New Jersey

Important!

Informative!

Timely!

Send for this booklet today!

3M COMPANY

ADHESIVES · COATINGS · SEALERS

Here's valuable information for export packagers—3M Adhesives which meet Government Specifications for export shipping!

If you ship overseas—or plan to in the future—you should have this booklet. It lists Government Specifications, typical 3M Adhesives meeting these specifications, their description, properties and application.

We've made it our business to keep up-to-date on the latest packaging specifications and the adhesives which will meet them. Let us put this background to work for you.

Send for this important new booklet today. Write 3M, Dept. 116, 411 Piquette Ave., Detroit 2, Michigan.

MINNESOTA MINING AND MANUFACTURING COMPANY • ADHESIVES AND COATINGS DIVISION

GENERAL OFFICE: ST. PAUL 6, MINN.
EXPORT AND CANADIAN SALES: 270 PARK AVE., NEW YORK 17, N. Y.

411 PIQUETTE AVE., DETROIT 2, MICH.

Optical Tooling Faces Its Biggest Test

Accuracy of reassembly after teardown is under study for Air Force.

By Irving Stone

Progress with the optical tooling system indicates that this fixture-alignment technique is headed for extensive adoption in U. S. airframe production.

Republic Aviation Corp.—pioneer in refinement of the optical system in combination with standard German pipe-frame castings to simplify airframe fixture setups—is now nearing completion of phase II of its Air Force contract for evaluation of this large tooling technique (AVIATION WEEK Dec. 11, 1950).

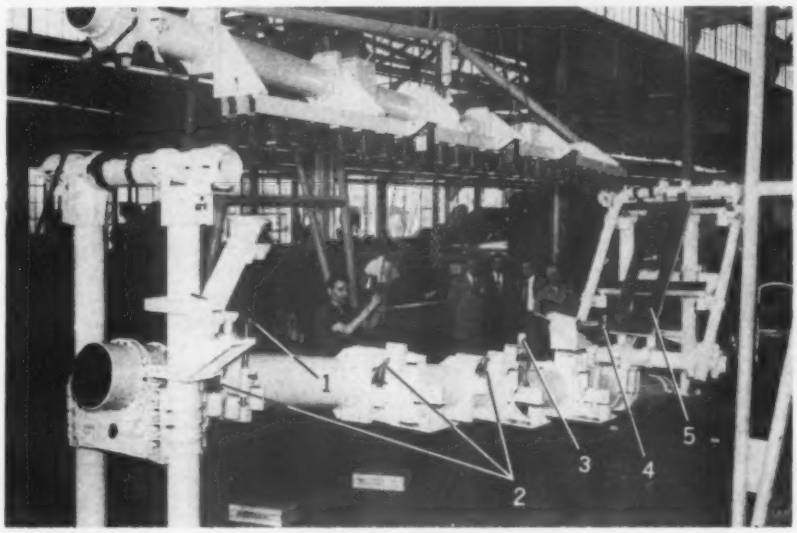
Under phase II, actually a service test trial, Republic tooling technicians are setting up large fixtures for production aircraft of other leading airframe builders.

▶**Cross-Country Trial**—Last week some of these tools were being torn down, for air shipment to the various factory sites and reassembly there using the optical procedure. This operation not only will serve to establish the general feasibility, accuracy and advantages of the optical tooling system, but will also show its potential for affording a quick manufacturing-comeback after plant emergency shutdown.

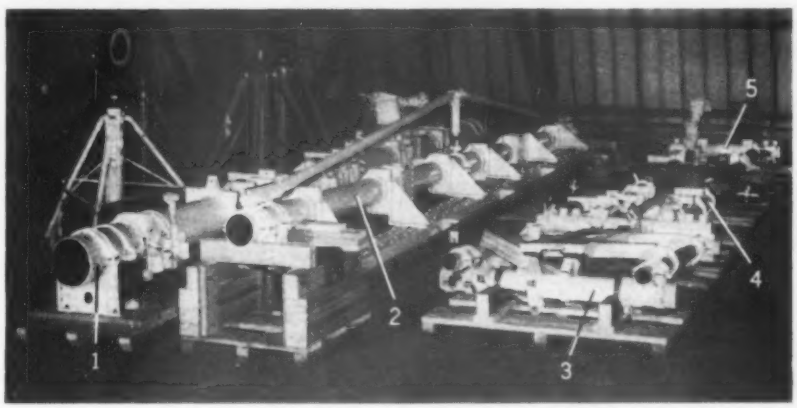
Thus, if an airframe factory using fixtures set up with optics and frame castings were bombed out or shut down for some other reason, these tools (or others taken from an emergency stockpile) could be quickly disassembled and flown to another site suitable for manufacture and re-erected there so that production could be resumed with little delay. Even new fixtures could be set up from scratch, at the same site or at a distant location, in a considerably shorter time than would be necessary for the erection of the conventional welded frame unit.

▶**Trial Fixtures**—Here are the four structures for which Republic has already built or is now building fixtures to test the teardown-air shipment-reassembly procedure under phase II:

• **North American F-95** (now designated F-86D) outer wing panel. Fixture for this structure is already built, disassembled and packed in five sections on skidding for shipment. These sections are two end frames each measuring 12 × 80 × 100 in.; base member (20 × 30 × 308 in.); top member (26 × 30 × 301 in.); and a drill plate frame (14 × 64 × 88 in.). Estimated weight of the fixture is 9,658 lb.



NORTH AMERICAN F-95 wing fixture with member carrying locators for leading edge-to-spar attachment separated for teardown. Other locator points: 1, rear spar; 2, aileron hinge fittings; 3, flap track; 4, landing gear; 5, drill plate.



F-95 FIXTURE ON SKIDS ready for air shipment, via Fairchild Packet, to West Coast. Components as skidded are: 1, base member; 2, top member; 3, drill plate frame; 4, inboard end frame; and 5, outboard end frame.

• **Lockheed F-94** fuselage midsection side panel. Fixture for this unit also is completed and was ready for disassembly and skidding when observed by the writer at Republic. It is a six-section structure comprising a panel section measuring 67 × 82 × 205 in.; base section (32 × 39 × 259 in.); and four diagonal braces (each 3½ in. dia., two 54 in. long, two 68 in. long.). Weight is approximately 6,838 lb.

(Both the F-94 and F-95 fixtures were slated for shipment to the West Coast on June 15. The 95 fixture is tagged for erection at North American on June 18-19; the 94 unit at Lockheed on June 21-22. This schedule gives a good idea of the speed with which this type of fixture can be transferred cross-country and set up for production.)

• **Douglas C-124** tail stub assembly.

• **Boeing B-47B** wing panel.

The fixtures for both the Douglas and Boeing structures are now in the process of building and should be completed in the very near future.

To build the fixtures, Republic re-

Specification Rubber

Complete Bonded Warehouse Stocks

You can depend on AMC Supply for all your rubber needs. All sizes and types of extrusions, neoprene compounds, foam rubber in flat or cored stock and sponge rubber. A complete range of thicknesses, sizes and widths. Send us your requirements.

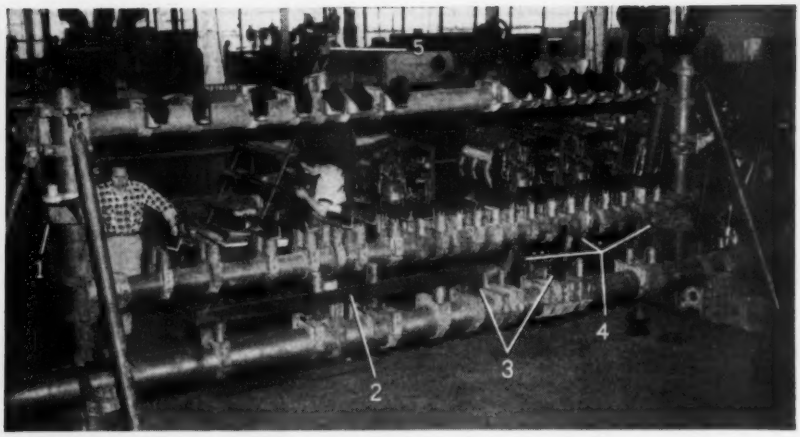
AMC Certified Precision Hardware to Your Specifications

AMC SUPPLY

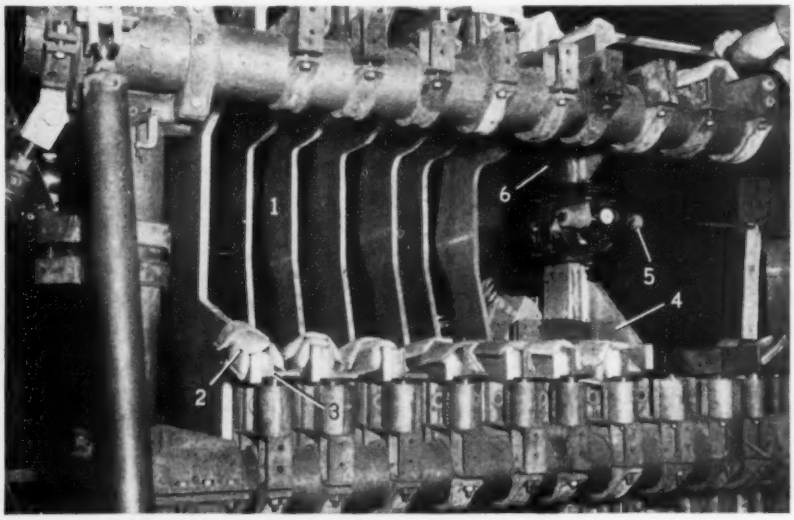
A DIVISION OF AIR ACCESSORIES

P. O. Box 1440 1400 Henderson

Fort Worth, Texas



LOCKHEED F-94 fuselage fixture before fitting alignment. Details: 1, base for scope's mount; 2, skin trim angle; 3, hinge bracket for another trim angle section (hinged to allow clearance for removal of part assembled in fixture); 4, drill hole fitting for canopy sill; and 5, Rato unit attach fitting.



F-94 FIXTURE showing: 1, fuselage contour plates; 2, weights to simulate Cerrotrue casting material to be poured; 3, attach angle with pin for anchoring to Cerrotrue cup; 4, adapter on optical positioner for locating contour plate; 5, collimator on positioner; and 6, positioner's straightedge.

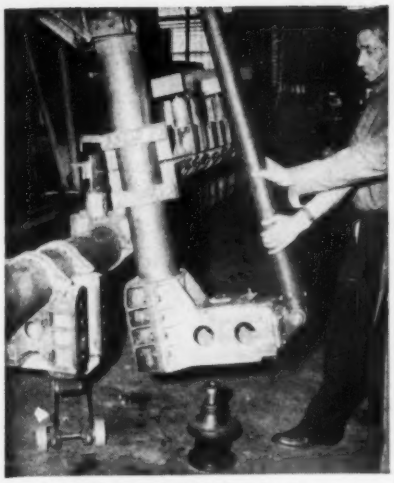
ceived from these four airframe fabricators the specifications and tool design drawings of the units as they now exist, and redesigned them so they can be built to use the Republic-developed optical positioner for alignment and the standard castings for erection. All these fixtures, built under supervision of project engineer Richard Stegler, are given a "dry run" teardown and re-erection to check accuracy of the tool before shipment to the airframe builder.

▶ **Advantages Reported**—Among the advantages of the optical tooling system for erecting assembly fixtures are:

- **Reduction in cost of tools,** thus lowering the cost of the aircraft.
- **Better fixture accuracy,** an important consideration in the fabrication of high-speed planes.
- **Easy breakdown** of fixtures into small components for quick shipment by air.
- **Rapid training** of comparatively inexperienced fixture-erection personnel.

With the conventional welded frame system, in many instances it was necessary to work to tolerances which were closer than the equipment (transit-level and piano wire) could afford, and the only recourse was to control dimensions by physically matching fixtures from a master. This involved many disadvantages, particularly in an expansion program.

- **If the master were destroyed** for any reason, an identical unit could not be reproduced.
- **If the master were very large,** it could not be made sufficiently rigid to insure that its shape could be maintained.
- **If shipment of the master** to a subcontractor were necessary there would be no accurate means of determining, upon its receipt, whether it were still



STANDARD CASTINGS make fixture teardown easy. Split point is between base casting T2G1017 (left) and T2G1019 and 20 units (right) which remain attached.

within the close tolerance requirements or had suffered distortion in transit.

▶**Coordinating Line**—With the use of optics, Republic technicians feel that there is a means of measurement to as great a degree of accuracy as may be required in the foreseeable future.

With the system, dependence is placed on an optical line of sight for coordination. This line of sight is considered a perfect standard because it travels in a known path (straight line, for practical purposes), it is unaffected by temperature, cannot wear, distort or sag, and does not exert pressure on the object being aligned.

By using optics as a control medium, it is only necessary to make masters when it is felt that it is more economical to build fixtures utilizing them.

▶**Savings**—Even though the advantages of the optical tooling system have been definitely established, it is still considered to be in the developmental stage.

And as more experience is gained with the technique, greater savings in setup time undoubtedly will be realized.

Already Republic technicians have proven that with the optical tooling procedure the setup time for a complete fixture with fittings can be about 30 percent less, on the average, that that required for a conventional welded type. In some instances, savings as high as 50-60 percent have been effected.

Savings on the erection time for the bare frame alone with the standard castings amount to 60 percent, on the average, as against time required for the welded frame.

▶**Optics, Castings Used Before**—The basic British (Taylor-Hobson) optical system and the Republic-developed accessories (optical positioner, spherical mounts for telescope and target reticle,

THE *NEW* ADEL 3-WAY

Yes—this new control valve for both commercial and military aircraft engines, not only decreases fuel consumption 3% to provide longer flying range and increased payload, but reduces maintenance costs—valve is mounted directly to front of engine and uses engine oil and pressure. It lowers supercharger temperatures, providing longer life of supercharger and exhaust collector ring. A completely sealed unit made especially to operate satisfactorily under extreme vibration conditions. Simple construction, extremely compact, small and lightweight.

Since 1925, PRATT & WHITNEY AIRCRAFT has been developing through research and engineering more and better power to help both commercial and military aircraft achieve even higher levels of performance and service.

Here, at ADEL, is also a proved combination of creative engineering, experience and facilities for quality production in the highly specialized field of Aviation Hydraulic Equipment. ADEL also produces the most complete line of AN Standard aircraft Clips and Clamps available.

For Dependable Performance *... Specify* ADEL ... For complete engineering specifications and counsel, address: ADEL DIVISION, GENERAL METALS CORPORATION, 10777 Van Owen St., Burbank, Calif.

ADEL LEADER IN HYDRAULICS

DIVISION OF GENERAL METALS CORPORATION • BURBANK, CALIF. • HUNTINGTON, W. VA.

CANADIAN REP.: RAILWAY & POWER ENGINEERING CORPORATION, LIMITED

Exhaust Dependability...

a Must!

EXHAUST PIPES, BUILT BY SMITH-MORRIS— They're on this Wright Turbo-Cyclone 18 Engine.

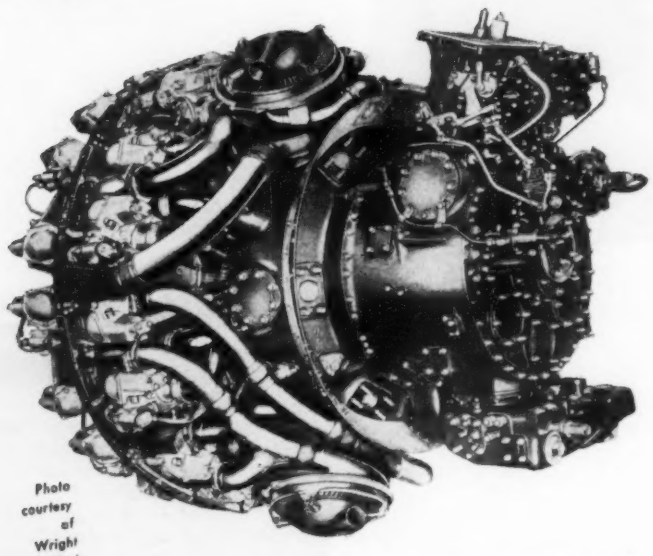


Photo courtesy of Wright Aeronautical Corp.

When engine power can drop critically through exhaust stack failure, it calls for carefully made and precision-fitted pipes. Smith-Morris makes these, complete—makes them economically—turns them out at war speeds. That's the Smith-Morris specialty: producing unusual high-temperature alloy parts in unusual ways . . . What can we make for you?

SMITH-MORRIS COMPANY

AIRCRAFT EXHAUST MANIFOLD SYSTEMS
GAS TURBINE PARTS AND ASSEMBLIES

FERNDALE 20, MICHIGAN

adjustable brackets, etc.) were described in AVIATION WEEK's Dec. 11, 1950, discussion of the evaluation of the optical tooling technique, together with a brief mention of the German castings for frame assembly.

Actually, the basic optical instruments and the castings had been used in aircraft fixture fabrication before—but not together.

The British used the elementary optics for the Avro Lancaster and obtained fairly accurate results, but the job was a tedious one and required highly skilled toolmakers.

The castings were introduced first in Germany at the Henschel aircraft works in 1938, later made standard equipment by the German Air Ministry and were used extensively during the war in that country's aircraft industry. Japan acquired rights to their use in 1942.

Republic engineers saw the advantages of combining the optics and castings into a single system arrangement.

▶ **Phase III Completed**—The castings, too, are a part of Republic's AF optical tooling contract. Phase III calls for the design of American standard counterparts of the German units. Though phase II has not yet been completed, Republic pushed up its schedule on phase III and already has finished it.

Chief differences between the American and German standards are the use of the English instead of the metric system; inclusion of provision for use of 10-in. pipe in the American standards; the method of attaching sway braces; and other changes generally improving the German design.

These American standards shown in the accompanying illustration, are only tentative proposals and probably will be revised and supplemented as more experience with the system is gained.

The castings are manufactured for Republic by Columbian Bronze of Freeport, Long Island, N. Y.

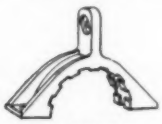
▶ **Casting Relations**—Here are some of the uses and combinations possible with the various casting units (the part numbers are Republic's; in the following tabulation, only the last two digits are used except in initial listing):

- **T2G1001:** This is a simple clamp used with other components for anchoring frame pipe.
- **02:** This clamp has flat surface which serves as small mounting face.
- **03:** Clamp eye is used for attachment of sway brace.
- **04:** Larger mounting surface is afforded here and unit can be used with part 38 for sway brace attachment.
- **05:** Used instead of 04 for 3-in. pipe only.
- **06 and 07:** Serve where top and top and side mounting faces, respectively, are desired.
- **08 and 09:** Right angle hookup units incorporating equal bores and unequal legs, and unequal bores and unequal legs, respectively.
- **10 and 11:** These castings have equal

Standard Castings for Fixture Construction

T2G1001
CLAMP-STRAP
4, 6, 8, 10, 12"-ST'D PIPE

T2G1002
CLAMP-SURFACE
2, 3, 4, 6, 8, 10, 12"-ST'D PIPE

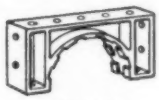


T2G1003
CLAMP-EYE-STRAP
3, 4, 6, 8, 10, 12"-ST'D PIPE

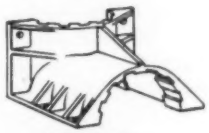
T2G1004
CLAMP-ADAPTER
4, 6, 8, 10, 12"-ST'D PIPE

T2G1005
CLAMP-UTILITY
3" ST'D PIPE ONLY

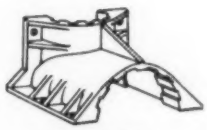
T2G1006
CLAMP-BOX
4" ST'D PIPE ONLY



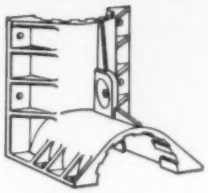
T2G1007
CLAMP-BOX
6, 8, 10, 12"-ST'D PIPE



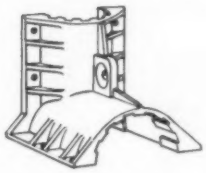
T2G1008
CLAMP-RIGHT ANGLE
UNEQUAL LEGS
4X4, 6X6-ST'D PIPE



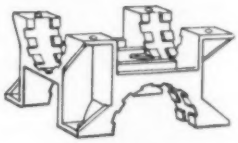
T2G1009
CLAMP-RIGHT ANGLE
UNEQUAL BORES & LEGS
6X4, 8X6"-ST'D PIPE



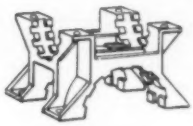
T2G1010
CLAMP-RIGHT ANGLE-EYE
4X4, 6X6, 8X8"-ST'D PIPE



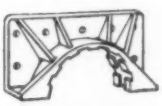
T2G1011
CLAMP-RIGHT ANGLE
UNEQUAL BORES
6X4, 8X6-ST'D PIPE



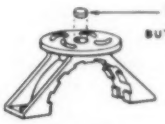
T2G1012
CLAMP-CROSS OVER
4X4, 6X6, 8X8-ST'D PIPE



T2G1013
CLAMP-CROSS OVER
UNEQUAL BORES
6X4, 8X4, 8X6-ST'D PIPE



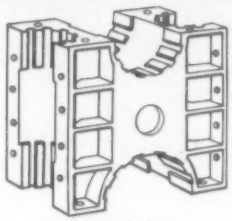
T2G1014
CLAMP-FLANGE
3, 4, 6, 8, 10, 12"-ST'D PIPE



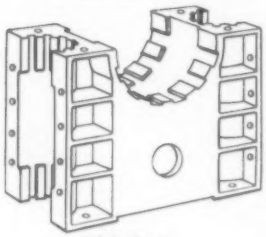
T2A1037
BUTTON-CENTERING

T2G1015
CLAMP-SWIVEL
4, 6, 8, 10, 12"-ST'D PIPE

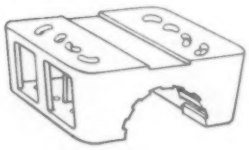
T2G1016
CLAMP-SWIVEL-FLANGE
4, 6"-ST'D PIPE



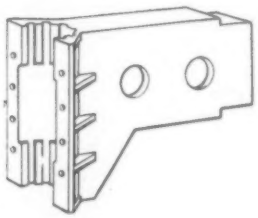
T2G1017
BASE-FOUR BORE
6X6X6X8"-STAND PIPE



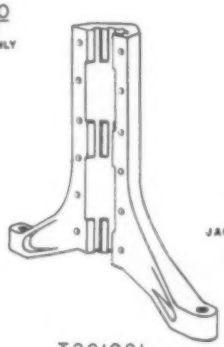
T2G1018
BASE-THREE BORE
6X6X10" } ST'D PIPE
6X6X12" }



T2G1019
BASE-SWIVEL-SPACER
6" ST'D PIPE ONLY

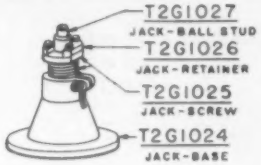


T201020
BASE-END
6" ST'D PIPE ONLY



T2G1021
BASE-VERTICAL FRAME
4" ST'D PIPE ONLY

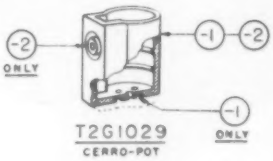
T2G1022
ELEVATOR LEG



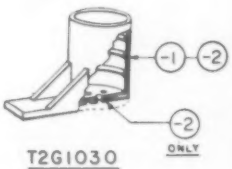
T2G1027
JACK-BALL STUD
T2G1026
JACK-RETAINER
T2G1025
JACK-SCREW
T2G1024
JACK-BASE

T2G1023
JACK ASSEMBLY
6,000 LBS.

T2G1028
CLAMP-UNIVERSAL STRUT
2, 3, 4"-ST'D PIPE

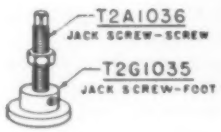


T2G1029
CERRO-POT



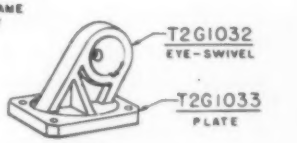
T2G1030
CERRO-POT-LEG

T2G1031
CLAMP-SPLICE
4, 6, 8, 10, 12"-ST'D PIPE



T2A1036
JACK SCREW-SCREW
T2G1035
JACK SCREW-FOOT

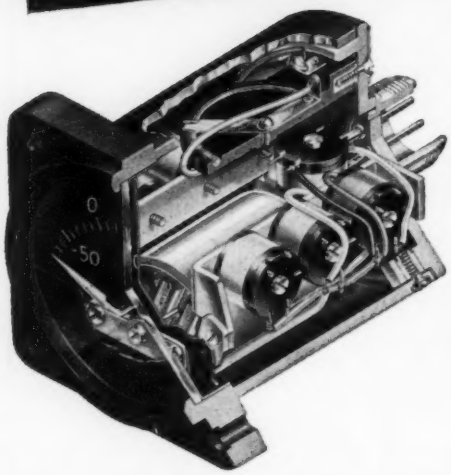
T2G1034
JACK SCREW-ASSEM.
1,000 LBS.



T2G1032
EYE-SWIVEL
T2G1033
PLATE

T2G1038
EYE-SWIVEL
ASSEMBLY

How EDISON Indicators Save 35 Pounds



EDISON electrical resistance temperature indicators were recently specified for cylinder head indication on a new type of four-engine transport. In this installation, two dual indicators and eight bulbs were used . . . at a weight saving of *35 pounds* under the thermocouple system formerly employed.

Weight economy is only one of the many features associated exclusively with EDISON instruments. Of special interest to maintenance engineers is the ability of EDISON indicators to adapt themselves to *any* temperature measurement application. The EDISON ratiometer movement is standard for all indicators whether used for cylinder head, oil, air, heating duct, etc. This standardization permits the temperature range in any given indicator to be changed merely by substituting a new dial and a few low-cost resistors.

It will pay you to investigate this proven way to save weight and cut maintenance costs. For complete information on indicators, send for our new Bulletin #3023. And for matching resistance bulbs, ask for Bulletin #3016.

Thomas A Edison
INCORPORATED

Instrument Division
52 Lakeside Avenue, West Orange, N. J.

•

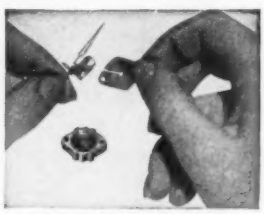
OTHER INSTRUMENT DIVISION PRODUCTS

Fire Detection Systems • Engine Gages
Temperature Indicating & Alarm Systems
Time Delay Relays • Sealed Thermostats

Only EDISON Temperature Indicators have all these features

READABILITY WHERE IT COUNTS

Scale is expanded at center of range where operating temperatures are located.

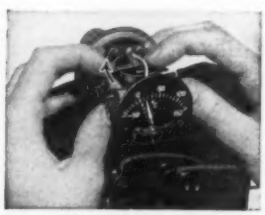


RUGGED, TROUBLE-FREE CONSTRUCTION

Rotor is just a magnet on a steel shaft – No delicate moving coil.

EASE OF OVERHAUL

No special tools—No delicate hairsprings – Jewels easily replaced.



EASE OF CALIBRATION

Merely move the contact on a rheostat—No coil calibration.

YOU CAN ALWAYS RELY ON EDISON

legs and bores, and equal legs and unequal bores, respectively. Each has eye for sway brace attachment.

- **12 and 13:** Crossover arrangements having equal and unequal bores, respectively.
- **14:** Used where mounting flange is desired vertical to pipe.
- **15:** Used where two pipes are to cross each other at angle other than 90 deg. through use of swivel feature which accommodates complementary casting.
- **16:** Clamp has swivel-feature mounting flange vertical to pipe centerline.
- **17, 18, 19 and 20:** These are base castings each useable with any of the other three. The 19 unit has swivel provisions to give pipe angularity other than 90 deg.
- **21:** Applicable for light fixture setup.
- **22:** This accessory is used with unit 20 to give greater height off the floor.
- **23 and 34:** These jacks are used to support heavy and light fixture bases, respectively.
- **28:** Sway brace end—can be used with units 03, 10, 11, and 38.
- **29 and 30:** Pots used to receive Cerrotrue casting material for anchoring tubular connections on fittings. Unit 30 is employed where fitting is to be pot-mounted to one side.
- **31:** Used for splicing short pieces of pipe.

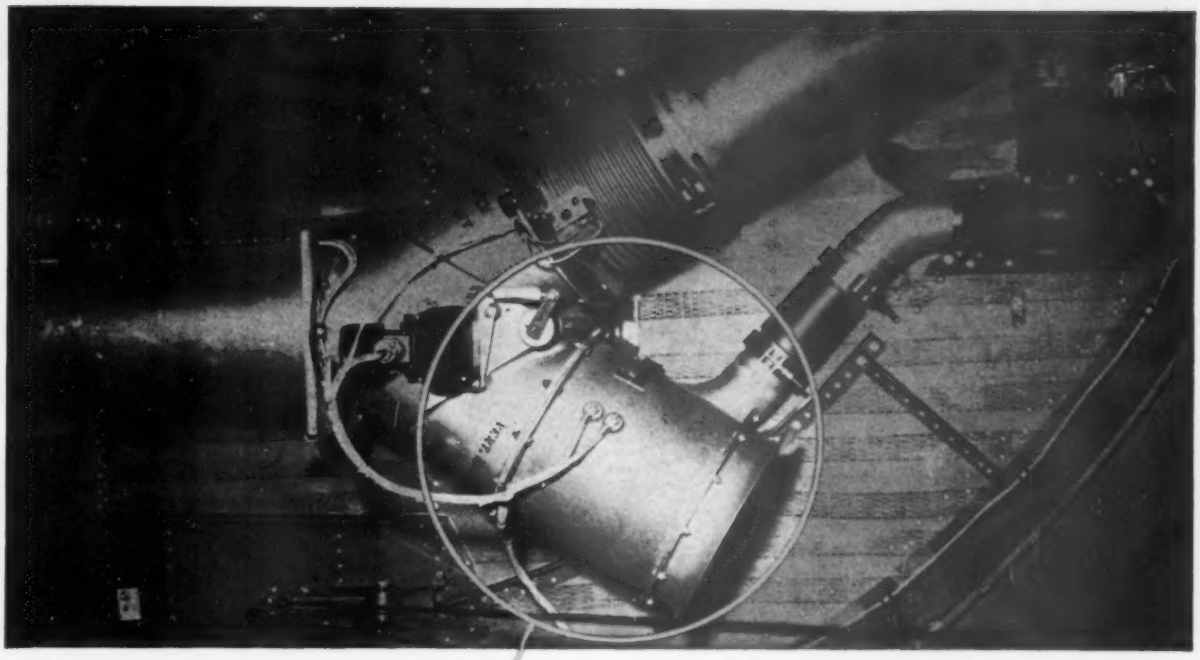
Sizes of these casting units are designated by dash numbers, as T2G1007-6 or T2G-1008-4X4.

► **Casting Use Example**—The ease of frame assembly or disassembly is illustrated in the large base units used for the Lockheed F-94 fixture. The casting arrangement is a combination of 17, 19, 01 and 20 units.

At the split point on the 17 casting there are but 8 bolts—4 on each side of the pipe. In addition, there are special draw-type dowels which have a tapered lead to aid in exact re-alignment. The head is threaded so that the dowel may be pulled rather than driven out. For this purpose, a deep draw-nut screws onto the threaded head and pushes against the casting, so pulling the dowel. Removal of the 8-bolts gives the separation.

► **Development Background**—The optical tooling system as it exists today didn't emerge full grown from any one brilliant idea. The elements of the system—optics and castings—were plugged, and hard, by the Air Materiel Command, particularly by Major Lyle C. Freed. These elements were supplemented with other developments and coordinated in painstaking trials by Republic technicians who, with Freed, saw their potential for simplifying airframe fixtures.

Taking the basic Taylor-Hobson optical instruments that had been used in England in its shipbuilding industry and to a limited extent in its aircraft production, Maj. (then Capt.) Freed, with A. J. Wurstner and J. R. Austin of AMC's inspection division and Capt. (then Cmdr.) O. S. Reading of the U. S. Coast and Geodetic Survey, visited various airframe builders here in



JOY® AXIVANE® AIRCRAFT FANS

warm airborne troops before take-off

To protect our airborne troops in frigid areas before take-off, Joy AXIVANE Aircraft Fans are installed in these huge troop-carriers to blow heated air into the main cabin while the plane is on the ground. Ram effect is utilized for this purpose after the carrier is airborne. Air from the fan is mixed with a metered stream of air from the heater to provide the desired air temperature in the duct. Thus, cold weather is no hindrance to the fast, efficient transportation of our fighting men to any theatre.

This highly-efficient 1.5 H.P. fan produces 1100 C.F.M. at 5.5" static pressure, yet weighs only 22 pounds and is only 9" in diameter. A & N design specifications. Superior features of all Joy Aircraft Fans are compact design, shock-resistant strength, minimum operating noise, and the most favorable air volume-to-weight and electric-to-air power ratios.

W&DA3440

● Joy designs and builds each fan to the exact requirements for which it is intended. Each fan, therefore, is custom-engineered for highest efficiency. For many purposes stock fans can be supplied from the extensive line already designed. Both single and two-stage units available. Optional features include straight or flared inlets, beaded or flanged connections, radio noise-filters, anodization, and cooled motors where required.

★ ★ ★ ★ ★

Here are some of the many uses for Joy AXIVANE Aircraft Fans: Windshield de-frosting, windshield or wing de-icing, cabin heating, cabin ventilating, cockpit heating, cooling radio and electronic equipment, cooling voltage regulators, oil cooling, gear-box cooling, instrument cooling, air recirculation, and high-altitude pressurizer boosting.

Write for Bulletin, or

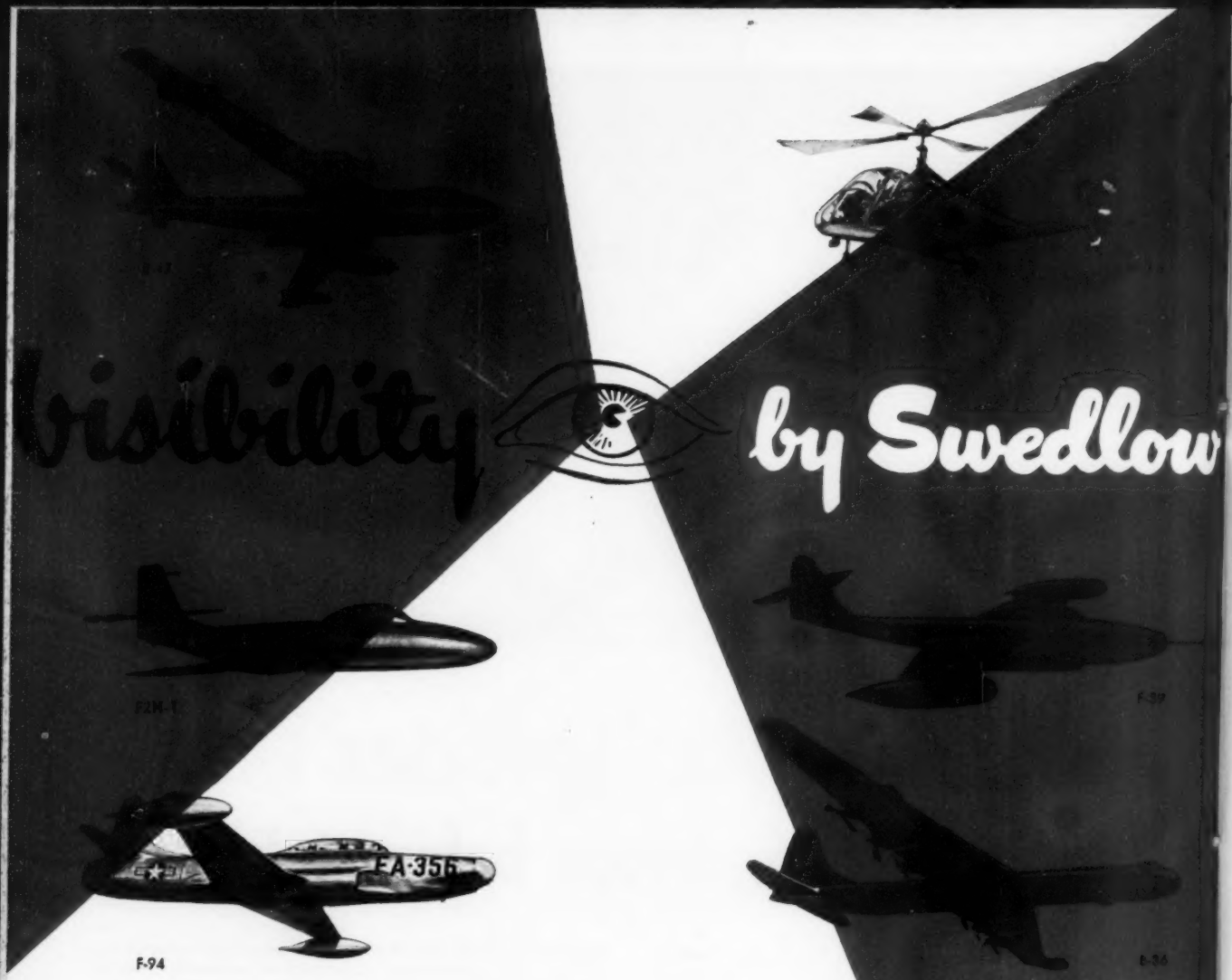
Consult a Joy Engineer

100 Years of Engineering Leadership

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO



PIONEERS IN *Acrylics*

In the vast new expansion of our air might, SWEDLOW specialization in acrylic enclosures for aircraft is playing an increasingly important part.

10 years of pioneering in the precision engineering and production of astrodomes, canopies and windows—with perfection in optical properties, regardless of size—has been an important factor in bringing to SWEDLOW the contracts of the great names in the aircraft industry.

Two plants in California and the centrally located plant in Ohio are now at the service of the aircraft industry, with duplicated facilities and tooling as a precautionary measure for any emergency.

Swedlow PLASTICS CO.

● *We shall be glad to assign a staff engineer to work with you in solving problems in plastics connected with new developments in the industry.*

SWEDLON—another [illegible] LOW specialty—is cur[illegible] being supplied, as Fuel Backing and Cargo-liner, the leading aircraft manufacturers of the U.S. and Canada.

1946 to get their reaction on the use of optics for fixture alignment.

Reports are that interest generally varied from negative to indifferent. The fundamental instruments didn't appeal to the industry at large on the basis of methods used by the British, which rendered their application particularly sensitive to tilt (angular error) and required very accurate adapaters and exceedingly rigid fixture structure.

▶ **Republic Interested**—However, Republic tooling engineers showed an immediate interest and the company went ahead with its own preliminary planning to determine what could be done to adapt the basic instruments for efficient fixture alignment. Republic obtained an initial small exploratory AF contract in February, 1947. This investigation showed the shortcomings of the system as previously used and also revealed what improvements were possible.

Then followed an industry-wide meeting at Republic in March, 1948, for a general discussion of the application of optics, and the airframe builders—particularly Boeing's toolers—evidenced their interest.

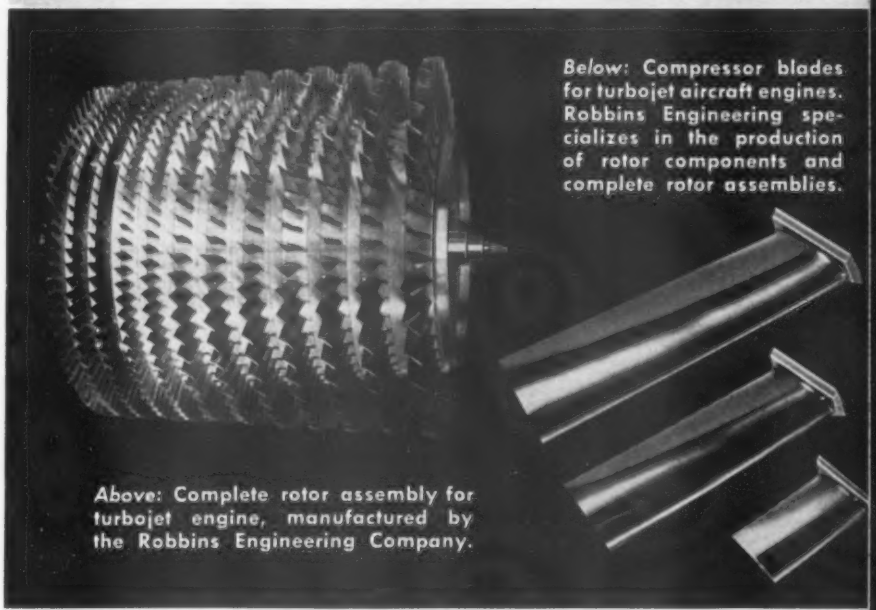
▶ **Accessories Developed**—From this point, Republic's tooling expert, Adolph Kastelowitz, and his associates, started research on and development of the accessories needed to make practical the use of optics for fixture alignment. Out of this work came the spherical mounts for alignment of the British Taylor-Hobson telescope and target reticle; optical positioner for mounting the collimator, optical square, fixture fitting adapter plate and fitting to locate points in relation to the established line of sight; adjustable brackets, and other devices. These developments were demontrated at an AF-sponsored industry meeting at Boeing's Wichita plant in June, 1949.

▶ **Enter Castings**—Meanwhile, Freed was pursuing further the simplification of fixture construction. Working with him at AMC was August Bringewald, German-trained production engineer, who now is Republic's chief of manufacturing research and development.

Freed had heard of the standard German castings and Bringewald was familiar with their use in Germany's airframe production. Bringewald made sketches of the units, made a ⅛-scale model of a fixture using them to facilitate study. After this, he and Freed went to Germany in 1947 to collect available data and castings. Forty tons of the structural units were shipped to this country from Messerschmitt's tool plant in Kematen and the main assembly site in Augsburg.

▶ **Second Contract Awarded**—Republic's technicians saw the advantages of combining the optics with the structural castings in fixture work. As a result of the company's optical tooling develop-

Jet Compressor Parts



Below: Compressor blades for turbojet aircraft engines. Robbins Engineering specializes in the production of rotor components and complete rotor assemblies.

Above: Complete rotor assembly for turbojet engine, manufactured by the Robbins Engineering Company.

Machined and Assembled to Rigid Specifications

The machining of jet compressor parts and the assembly of complete rotor units require an organization having specialized tooling and inspection equipment and plenty of aircraft know-how. Turbojet engine builders are enthusiastic about the work of the Robbins Engineering Company, a subsidiary of Ex-Cell-O Corporation.

The Robbins organization is cooperating whole-heartedly with the program to build up air power for the defense of our country. All its efforts will be directed toward this end in the present emergency.

ROBBINS ENGINEERING COMPANY
Subsidiary of
EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

51-20

BARBER COLMAN

Temperature

SENSING ELEMENTS

ENGINEERED AND DESIGNED FOR YOUR SPECIFIC AIRCRAFT REQUIREMENTS

Barber-Colman engineers will assist you in the design of any type of Sensing Element for individual applications. For further information on Barber-Colman Aircraft Products, write for Bulletin F-4141.

BARBER-COLMAN COMPANY

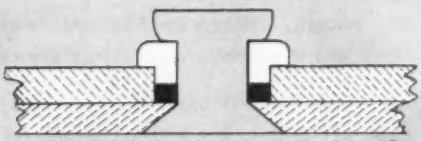
1252 ROCK STREET • ROCKFORD, ILLINOIS

REPRESENTATIVES IN: LOS ANGELES, SEATTLE, DALLAS, CHICAGO, DETROIT BUFFALO, PHILADELPHIA, BALTIMORE, NEWARK, NEW YORK, MONTREAL

BARBER COLMAN

Lock O Seal FLUSH RIVET SEALS provide permanent sealing for more than *10 years

*Based on laboratory accelerated ageing tests



Designed for integral fuel tanks or wherever permanent, pressure proof sealing is required around rivet and between mating surfaces.

Write for CATALOG

FRANKLIN C. WOLFE CO., Inc.

11723 Mississippi Ave. • Los Angeles 25, Calif.

Manufacturers of Termin O Seals and Lock O Seals

ment, it was able to prepare a proposal to AMC showing what amount of refinement was necessary to adapt the optics and castings to aircraft industry requirements. It was given an AF contract in November, 1949, further to evaluate the tooling technique. Included in the contract were the trial fixtures to be built for Lockheed, North American, Boeing and Douglas.

▶ **Other Companies' Work**—Fairchild Engine & Airplane Corp. has recently received one of the Republic optical positioners and reports are that it is using it for comparison with a coordinate setting machine—another optical system for locating points in space.

Boeing received one of the positioners some time back and is reported to be using it at a subcontractor's plant building tooling for the company. Boeing's Wichita plant is said to be using the optical system for the B-47, but not with all the refinements developed to date. Boeing is also working with it in Seattle.

Lockheed is training personnel in the use of the optical system, reportedly preparatory to applying it on some new production contracts.

North American is also studying application of the system to its production.

Republic still hasn't reached the end of its development efforts to extend the versatility of the system. Even now its technicians are working on further refinements for greater efficiency in fixture alignment.

Garnet Abrasive Saves Blasting Costs

Sand is synonomous with savings at Ryan Aeronautical Co. A switch in abrasives used for sandblasting stainless steel exhaust system parts in inspection operations is conserving valuable processing time.

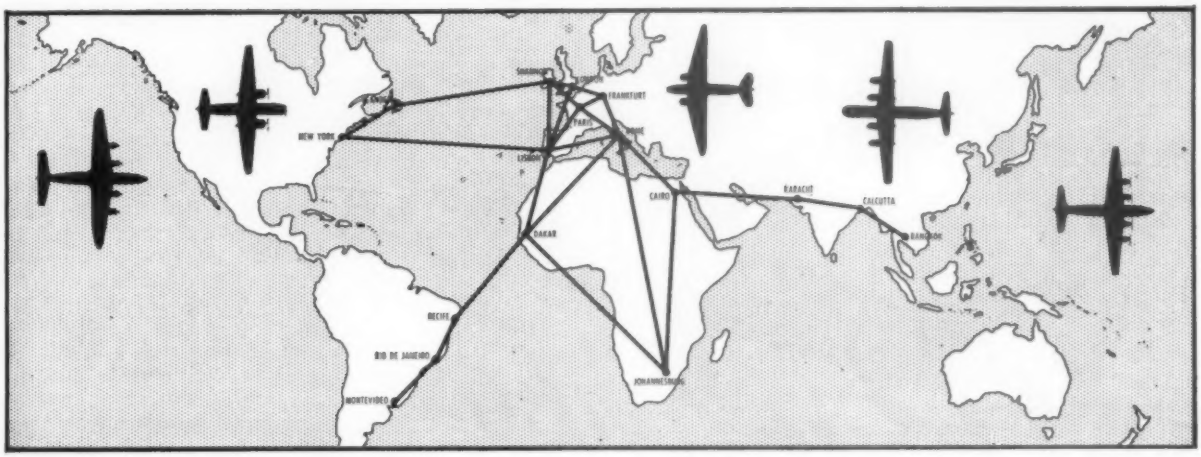
Ryan had been using a white silica sand for its high-pressure blasting. This material deteriorated rapidly into ineffective "round" crystals, creating a fine dust.

A reddish garnet sand was substituted and found to have 50 percent better "staying" power. With the new material less air pressure is required and the dust problem is minimized. Microscopic examination showed that when garnet sand crystals broke down they still retained their sharp features.

There are other advantages: Because the garnet sands lasts so much longer, the sandblasting machines do not have to be filled as frequently; less residue means that trucking costs are cut; the new material is more moisture-resistant, hence has less tendency to clog the blasting machine; and it does a faster job.

KEY POINT PROGRAM

- provides aviation special products
- in conveniently small containers
- at key airports around the world



Relatively small amounts of certain aviation special petroleum products required for servicing today's transport aircraft share the responsibility, as much as gasoline and engine oil, for thousands of trouble-free air miles flown around the world every day. Although essential to the proper maintenance of modern aircraft, not all of these products are constantly required away from the home base, particularly in the normal container sizes usually stocked.

For this reason, marketers of Esso Aviation Products determined which special products are called for most often on the well-travelled air routes of the world and established a basic group of Esso Aviation Special Products used for aircraft lubrication and as hydraulic fluids.

In addition to the hundreds of other airports where Esso Aviation Products and service are offered, these aviation special products are now available at all times in convenient, small containers at 17 key airports along the world's airways.

The smaller containers minimize waste and the possibility of contamination. Airline operators find them especially convenient for "topping off" or for service en route. In every respect, the key point program means added security to pilots, flight engineers and international aircraft operators.

Esso Aviation Special Products are made to exact specifications and cover the air-frame and accessory lubrication requirements of all commercial transports in general use today. Their quality and dependability have been proved in millions of miles of flight.

The complete line of Esso Aviation Products:

Gasolines	**Turbo Fuels**
Engine Oils	**Turbo Oils**
Gear Oils	**Corrosion Preventives**
De-icing Fluid	**Anti-seize Compounds**
Greases	**Hydraulic Fluids**

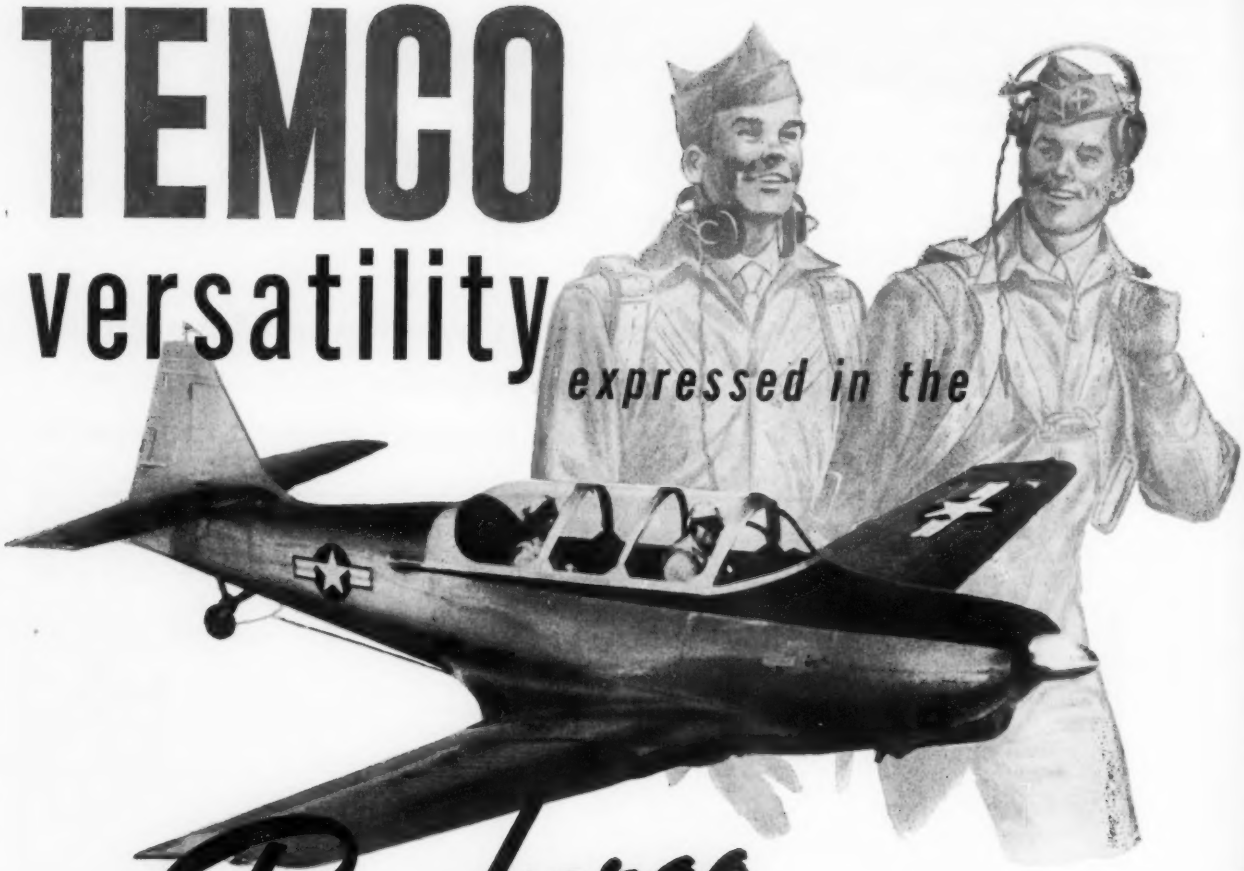
AVIATION PRODUCTS

WHERE you want them • WHEN you need them . . . ALONG THE AIRWAYS OF THE WORLD

ESSO EXPORT CORPORATION, AVIATION DEPARTMENT, 25 BROAD STREET, NEW YORK 4, N. Y.

TEMCO versatility

expressed in the



T-35 *Buckaroo*

MILITARY TRAINER

As rugged and ready as the colorful Texas cowpokes whose name it bears, the TEMCO BUCKAROO — now in limited service with the U.S.A.F. — is an advanced design, all-purpose military trainer specifically engineered to meet the requirements both operationally and costwise of modern present day air forces.

Another outstanding example of TEMCO versatility, the BUCKAROO is an all metal two-place tandem, low wing monoplane powered by a 165 HP Franklin Engine, unexcelled both for primary and basic training.

Throughout the design and development of the BUCKAROO, TEMCO engineers have concentrated not only on providing an airplane that will best meet military training requirements, but on providing one that will meet these requirements at the lowest possible cost both from the standpoint of original price and that of maintenance and upkeep. In the finished product, TEMCO is convinced that it has an airplane that will not only train military pilots better, but train them at less cost than any other trainer presently available.

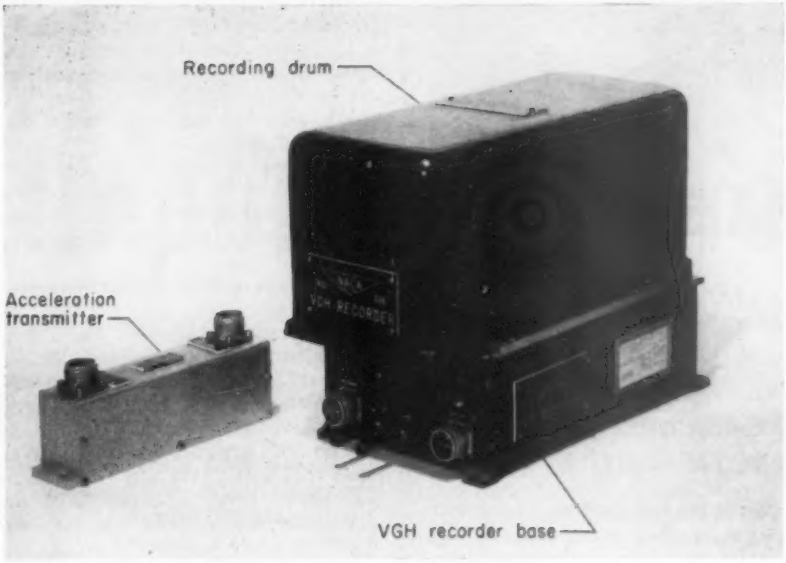
Designed for first flight as well as progressive military training, the BUCKAROO's range, instrumentation and design make it a truly all-purpose military trainer.

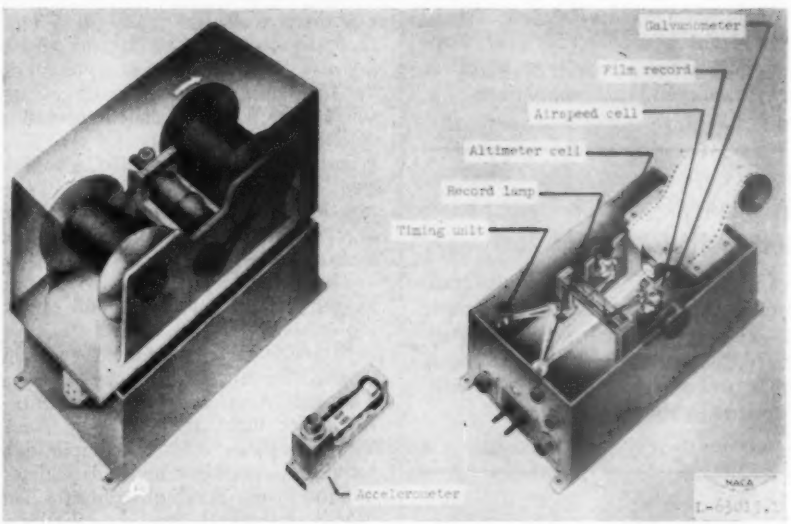
Rugged overturn structure of the BUCKAROO is an integral part of the forward canopy frame, providing full visibility from both cockpits in addition to full protection for both pilots.

TEMCO
TEXAS ENGINEERING AND MANUFACTURING CO., INC.
DALLAS, TEXAS

Texas Engineering and Manufacturing Co., Inc.

DALLAS, TEXAS





New Instrument to Study Gusts

NACA velocity-gravity-height recorder has advantages over airline type, but is designed only for research.

A new, compact flight-research aid is now being used for the collection of airline operating statistics bearing on gust-load problems.

And the unit affords time-history records of airspeed, acceleration and altitude for continuous periods stretching to as much as 100 hr.

Developed at the National Advisory Committee for Aeronautics' Langley Lab, the new equipment is known as the VGH (velocity-gravity-height) recorder and was designed to meet these requirements:

- **Continuous records** of airspeed, normal acceleration and altitude against time with an accuracy within 1 percent of full scale.
- **Minimum recording time** of 75 hr. per loading, with sufficient resolution to permit counting and measurement of individual acceleration peaks.
- **Inclusion of a remote** control acceleration transmitter for mounting rigidly near the airplane C.G., regardless of recorder location.
- **Volume no greater** than 1 cu. ft., weight not more than 25 lb., easy installation and loading.
- **Minimum operational period** of 500 hr. without overhaul.
- **Automatic operation** (from standard aircraft power supply) when plane is in flight.

Details of the device have just been released in Technical Note 2265

SIZE *or* WEIGHT

NO PROBLEM

FOR

Flying Tiger Air Freight

A single Flying Tiger Liner takes any load up to 20,000 pounds... and Flying Tiger has 35 special air freight liners, on multiple daily schedules, that carry anything from ailerons to engines—from instruments to helicopters.

Remember... Air Freight is a lot cheaper than Air Express and as fast or faster. In many cases Flying Tiger rates are lower than Rail Express. And there are 10 additional ways you can save with Flying Tiger Air Freight. For full information and an air freight analysis of your products, call your nearest Flying Tiger representative or write direct to Flying Tiger General Offices.

FLYING TIGER...

...a better way of shipping,
a better way of buying,
a better way of selling,
anywhere, any time, anything.

The Flying Tiger Line Inc.

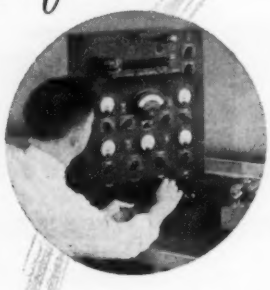
GENERAL OFFICES
LOCKHEED AIR TERMINAL
LOS ANGELES, CALIFORNIA

Agents in principal cities throughout the world.

...WORLD'S LARGEST OPERATOR OF AIR FREIGHT AIRCRAFT

WESTON TEST EQUIPMENT

...for electronic maintenance!

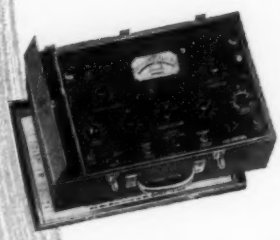


Mutual Conductance
ELECTRONIC TUBE ANALYZER

Model 686 is an "all purpose" tube analyzer that tests tubes under exact operating potentials. Accurately determines true mutual conductance of all tubes both in accordance with manufacturer's rated operating conditions, as well as at other values for non-standard applications.

High Frequency
ELECTRONIC ANALYZER (Model 769)

Three instruments in one: a Volt-Ohm-Milliammeter with self-contained power source—a high impedence electronic Volt-Ohmmeter using 115 volt 60 cycle power—a stable, probe type Vacuum Tube Voltmeter for use to 300 megacycles.



Portable Mutual Conductance
TUBE CHECKER (Model 798)

For general testing of all receiving tubes, voltage regulator tubes and thyratron tubes. Provides mutual conductance ranges 3000/6000/12000 micromhos.

* * *

Order through your local WESTON representative; or write for literature . . . Weston Electrical Instrument Corporation, 579 Frelinghuysen Avenue, Newark 5, New Jersey...manufacturers of Weston and TAGliabue instruments.

WESTON *Instruments*

"NACA VGH Recorder," by Norman R. Richardson of the Langley Lab.

It reports that from records now being obtained, these typical analyses can be made:

For gust research and related airplane loading—

- **Evaluation** of normal-acceleration increments and effective gust velocities.
- **Distribution** of these increments and velocities with airspeed, altitude or flight conditions.
- **Percentage of total** flight miles spent in rough air.

For operation studies—

- **Distributions** of airspeed and altitude.
- **Takeoff,** approach and landing speeds.
- **Percentage of flight** time in climb and descent.

The V-G recorder previously developed at NACA (AVIATION WEEK, Nov. 13, 1950) gave an envelope of the maximum accelerations and the airspeeds at which they would occur. Development of the new VGH recorder was dictated by the need for a continuously recording instrument affording a detailed distribution representing the frequency and intensity of gust accelerations with associated operating conditions.

▶ **Basic Considerations**—NACA's principal requirement was reliable recording of the desired functions with an accuracy and form to make the data useful for research.

The airlines were interested in size, weight, installation factors and reloading interval.

Although the requirements generally parallel those set down by the Air Transport Assn. and Civil Aeronautics Board for flight recorders, the ATA-CAB type is intended to compile data on airline operations and aid in determination of accident causes. The NACA unit was designed specifically as a research tool, hence was not compromised to meet the ATA-CAB requirements in detail.

Trace-type of amplitude recording was selected. Tests showed that the resolution of photographic film or paper was superior to that of the direct-recording types, which, in general, also require certain stylus pressures giving attendant friction errors.

It was determined that minimum record speed should be about 2 ft./hr. (.007 in./sec.). Under lab conditions, it is possible at this speed to distinguish peaks of the same amplitude at the rate of two per second and peaks of different amplitudes at five per second. The recording paper—70mm. wide by 200 ft. long—gives a recording time of about 100 hr. and easy visual inspection.

▶ **Makeup**—Three main parts of the instrument are the base which houses the recording elements, a recording drum and acceleration transmitter. The combined base and recording drum meas-

Important Information

IF you are a producer of products using steel, aluminum or copper, it is vitally important that you know what Controlled Materials Plan forms apply to your industry and how you may obtain them. We think the information on the three basic CMP forms listed below will be helpful.

FORM CMP-4A: For any producer of Class A products who is requested to apply for an authorized production schedule and related allotment by a Claimant Agency or consumer for whom he produces Class A products.

FORM CMP-4B: For any producer of Class B products who is requested by NPA to file an application with the appropriate Industry Division for an authorized production schedule and related allotment.

FORM CMP-4C: For any person requiring an allotment for controlled materials for use in construction.

Further information on Class A and Class B products, as well as applications for CMP authorizations and allotments on these three forms, are available at your local National Production Authority field office or their headquarters in Washington.

We also direct your attention:

TO CMP REGULATION NO. 4 which sets forth the rules under which distributors such as ourselves may make deliveries of controlled materials to their customers.

IT IS IMPORTANT for you to know that whenever you place an ***authorized controlled material order*** with a distributor either orally or by telephone, it must be followed by a written confirmation within 15 days. If a customer fails to comply with this provision, a distributor is required to report the delinquency to the National Production Authority.

WE THEREFORE URGENTLY REQUEST that directly after placing an authorized controlled material order either orally or by telephone with your distributor, you immediately send him a written confirmation. By doing this you will protect yourself and help your distributor and the National Production Authority keep CMP working smoothly.

UNITED STATES STEEL SUPPLY COMPANY

Warehouses and Sales Offices: BALTIMORE · BOSTON · CHICAGO · CLEVELAND · LOS ANGELES · MILWAUKEE · MOLINE, ILL. NEWARK · PITTSBURGH · PORTLAND, ORE. · SAN FRANCISCO · SEATTLE · ST. LOUIS · TWIN CITY (ST. PAUL)
Sales Offices: INDIANAPOLIS · KANSAS CITY, MO. · PHILADELPHIA · ROCKFORD, ILL. · TOLEDO · TULSA · YOUNGSTOWN

Headquarters Offices: 208 S. La Salle St.—Chicago 4, Ill.

UNITED STATES STEEL

ORLY FIELD, Paris, France. The first GCA radar landing system has just been installed by Gilfillan at the largest civil airport in France. The entire design, production and installation were accomplished by Gilfillan personnel...

Gilfillan sets are the *only* civil airport GCA equipment installed in Europe or the United States.

"C'est Magnifique!"

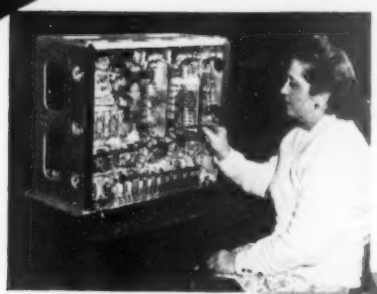
-on dit a l'aeroport d'Orly, Paris

"It's Magnificent!"

-they say in the U.S.A.

.0002" TOLERANCE OVER A 14-FOOT SPAN! Machining this 14-foot extrusion into a precision antenna was one of the tougher jobs Gilfillan solved. To do it, Gilfillan developed a special plaster vise. The extrusion, set in this vise, settled to its natural position while the plaster hardened. Then it was machined to .0002" tolerance with no chance of springing out of shape once it left the vise.

UNIQUE INSPECTION SYSTEM FOR QUALITY CONTROL. One reason for Gilfillan's acknowledged success in making "precision-plus" electronic equipment is its unusual inspection system setup. *A staff of 140 highly skilled inspectors reports directly to the head of the company.*



GCA *Gilfillan*

LOS ANGELES

FIRST AND FINAL WORD IN GCA RADAR

13 MILES OF CIRCUITRY SIMPLIFIED! Each production GCA has 13 miles of circuitry. Making it simple to assemble and simple to maintain was a challenge of major dimensions. Standard color coding of wiring wouldn't work. Therefore, Gilfillan devised a system of identifying each wire by *imprinting indelible numbers at one-inch intervals!*

TOWER CONSOLE. Gilfillan's new remoting equipment "pipes" GCA into the tower from the field antenna units. Now GCA is operated by *one man* of the regular tower personnel from a *compact, two-scope tower console, instead of the former bulky five-man, multi-scope equipment.*

4.

Now, on one handy chart (8½" x 5½") Color Codes, Calibration Symbols, Thermo Elements of Thermocouple and Extension Wires for ISA, U.S. Military and Aeronautical Specifications — Plus — Resistance Tables.

Write Today for your copy. No obligation, of course.

Thermo Electric Co., Inc.

FAIR LAWN, NEW JERSEY

50,000 PSI BOOST PUMP

Air Operated Hydraulic Boost Pump capable of output fluid pressures to 50,000 PSI from 100 PSI plant air supply.

Broadly applicable for static testing, powering presses for metal forming, shearing, clamping, etc. Various models available for either oil or water service applications where low volume output at high pressure is the requirement. Thousands in use. Simple . . . Reliable . . . Inexpensive.

Model 216-C measures 8¼" wide x 9⅛" deep

AIR OPERATED HYDRAULIC POWER UNIT

A self-contained unit supplied complete with Model 216-C Pump, oil reservoir and necessary controls. Capable of providing output fluid pressures to 30,000 PSI from 100 PSI plant air supply. For oil service only. Other models available for water or other corrosive liquids.

SPRAGUE ENGINEERING & SALES

1144 W. 135th St. Gardena, Calif.

ures 5¾ in. wide × 8¼ in. high × 12 in. long, and weighs 17 lb. This installation is normally shock-mounted and carried usually in the radio rack. The remote accelerometer is 1⅝ in. wide × 2⅛ in. high (excluding connectors) × 7¼ in. long, weighs 2¼ lb. It is rigidly mounted near the plane's C.G.

Each element uses a tilting mirror and lens to focus the image on the moving record paper. A .003-in.-wide slit passes the light to give fine lines.

To measure airspeed and altitude, two cells containing pressure-sensitive diaphragms are connected to the pitot-static lines. These diaphragms deflect in proportion to the impressed pressures and the motions are magnified and transmitted by the tilting mirror. Each cell houses a fixed mirror to provide record reference lines.

Receiver for the signal from the accelerometer transmitter is a d'Arsonval type of reflecting galvanometer.

An electric clock sweeps a mirror to give a line across part of the paper width for a 1-min. timing interval.

▶**Transmitter, Range Data**—The acceleration transmitter uses wire strain gages mounted on a cantilever beam and wired in the form of a Wheatstone bridge whose output voltage is proportional to the impressed acceleration. The beam is housed in a sealed case filled with silicone oil serving as a damping medium and protecting the gages from moisture.

A natural frequency of about 22 cps. is considered low enough to isolate it from engine vibration but sufficiently high to reproduce faithfully the gust accelerations normally encountered. To maintain the transmitter at a constant temperature, it is fitted with a 25w. heater and thermoswitch.

Full scale deflection for each function is about 1¾ in. Typical ranges are:

- 0 to 350 mph.
- −2G to 4G.
- Sea level to 30,000 ft.

Adjustments allow other ranges.

▶**Application Limits**—Accuracy of recording of the various elements is adequate for the statistical study of gust problems. But in actual practice, accuracy of data obtained with the instrument is also dependent on installation and reading errors. Installation error cannot be assessed in specific terms because it depends on a given aircraft structure and its pitot-static system.

Assuming a reading accuracy within ± .01 in. and correction of pitot-static errors by calibration, a measured airspeed of 250 mph. would have a possible error of ± 2½ mph. A speed of 100 mph. would be accurate within 5 mph.

Similarly, determination of pressure altitude would be accurate within

and now... Jets!

J-47
General Electric
Turbojet Engine

• From pistons to turbines—we continue to advance with the aviation industry. Our production includes substantial commitments for Gear Box Assemblies, Auxiliary Drives, Hydraulic Gear Box Drive Assemblies, and Gear Assemblies for J-47 Jet Engines.

With facilities that produced thousands of reciprocating engines in World War II, we are now manufacturing our own engines, airframe and landing gear components for the military services.

JACOBS

AIRCRAFT ENGINE COMPANY
POTTSTOWN, PENNSYLVANIA

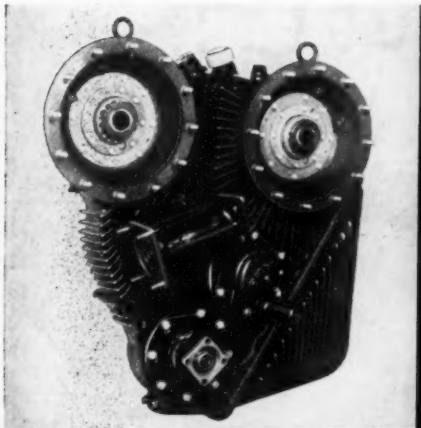
How to Solve

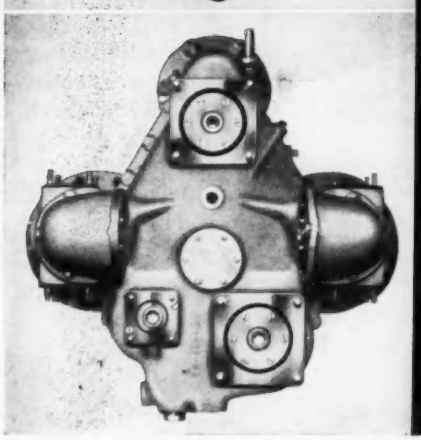
POWER TAKE-OFF PROBLEMS

1P ÷ 4A = ?

PROBLEM: Your problem may resolve itself to a requirement for four accessory drives but only one available pad. Modern aircraft engines are equipped with many power take-offs, but there are always demands for more to drive fuel pumps, hydraulic pumps, generators, alternators, de-icers, superchargers, air compressors, starters, etc.

SOLUTION: When the distribution of motive force to meet accessory drive requirements becomes your problem, consult Western Gear's experienced and capable aircraft application engineers. For more than a decade aircraft designers have brought their mechanical power transmission problems to Western Gear for economical, dependable and efficient solutions.





TYPICAL ACCESSORY DRIVES BY

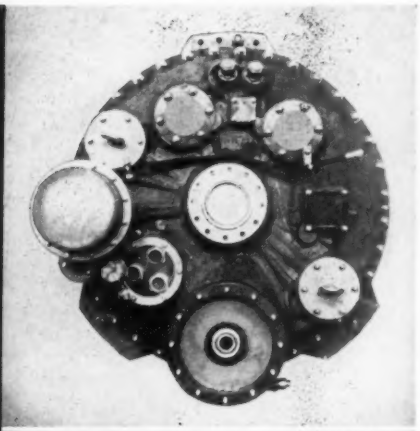
WESTERN GEAR

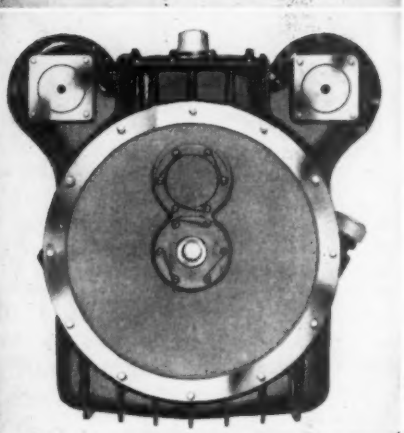
Gearmakers to the Aircraft Industry

Western Gear drives are used on all types of aircraft engines, for application to everything from standard commercial and military aircraft to rockets and guided missiles.

Units of many configurations, including integral accessory drives for a 10,000-hp propulsion unit, are in the usual realm of Western Gear experience.

For the *RIGHT* answer to any problem of gearing for aircraft, direct your inquiry to Western Gear Works, 2600 East Imperial Highway, Lynwood, (Los Angeles County) Calif.





5115

Plants • 417 Ninth Ave. S., Seattle 4, Wash.
2600 E. Imperial Highway, Lynwood, Los Angeles County, California
1035 Folsom St., San Francisco 3, Calif.
117 N. Palmer St., Houston, Texas

Representatives • 930 S.E. Oak St., Portland 14, Oregon
Room 211, Chamber of Commerce Bldg., Denver, Colorado
Engineering & Machinery Ltd., 1366 W. Broadway, Vancouver, B.C.

WESTERN GEAR WORKS

Manufacturers of **PACIFIC-WESTERN** Gear Products

Pacific Gear & Tool Works

Plants: Seattle, San Francisco, Lynwood (Los Angeles County), Houston
Representatives: Portland, Denver, Vancouver, B.C.

± 300 ft. at 30,000 ft., and accurate within ± 150 ft. at 2000 ft.

Measurement of acceleration at the plane's C.G. does not necessarily represent the acceleration of an equivalent rigid airplane because of the structural dynamic response. If the acceleration of an equivalent rigid airplane is desired, no accuracy of the measured data can be given since the effects of dynamic response will depend on a given aircraft. This problem remains to be resolved experimentally.

The instrument will give a mass of data with little operational effort. However, there is limited detail particularly in the acceleration record where the resolution permits the evaluation of effective gust velocity but does not permit evaluation of the gust structure.

While the record traces are clear, the cramped time scale does not make the details of the gust structure visible. For special studies, this difficulty could be eliminated by boosting paper speed. This change would shorten the reloading interval and reduce the applicability of the instrument for use on the airlines.

Book Tabulates College Research

The engineering schools of American colleges and universities are spending in excess of $50 million annually to carry on over 5,200 engineering research projects, representing the efforts of more than 11,500 faculty, graduate students and research engineers.

These data highlight the 1951 edition of the "Review of Current Research" published by the Engineering College Research Council of the American Society for Engineering Education.

The book has been called the only complete guide to the current research contribution of engineering schools. It lists complete project titles, names of responsible administrative officers, the governing research policies, number of personnel engaged in research, annual expenditures and special conferences and short courses of interest.

The Research Council believes that this volume should be a useful guide to the research activity and capacity of American engineering schools. The listings are correct and complete as of Mar. 1, 1951.

As one indication of the amount of aeronautical research going on, the index lists 63 different projects under "Aircraft," 31 under jet propulsion and 39 under "Supersonics."

Copies of the book may be obtained from the Secretary of the Engineering College Research Council, Room 7-204, 77 Massachusetts Ave., Cambridge 39, Mass. Price is $2.25.—DAA

high-gloss enamels that out-perform old-style finishes

PROVED-

by airlines, who report that the lasting color and gloss of Glidair Aircraft Enamels reduce cost and time required to maintain the smart appearance of their planes —practically eliminating the need for polishing of painted areas.

by maintenance shops, who say that Glidair Enamels are easier to use and provide uniform, beautiful results that last.

by manufacturers, who have found the brilliant colors, the wide range of shades and the smart finished effects of Glidair Enamels important plus factors in the sales appeal and customer acceptance of their finished aircraft.

In addition to top-quality enamels, Glidair Finishes include specially formulated products for every aircraft need—civilian or military.

THE GLIDDEN COMPANY

AVIATION SALES HEADQUARTERS • 11001 MADISON AVE., CLEVELAND 2, OHIO

Exclusive Export Distributors:
AVIQUIPO, INC., 25 Beaver St., New York 4, N. Y.

Speed Nuts®
ON REVIEW
Whether it is production for defense . . . for civilian needs . . . or for full-scale warfare—Tinnerman SPEED NUTS have proved their time-saving advantages. Think first of SPEED NUT brand fasteners when you are seeking a way to fasten it better—in less time—at lower cost. For technical assistance on fastening problems, call in your Tinnerman sales engineer—or write
TINNERMAN PRODUCTS, INC. • Dept. 12, Box 6688, Cleveland 1, O.
TINNERMAN SPEED NUTS
FASTEST THING IN aircraft FASTENINGS

Gust Alleviators

U. S. system based on wing deflection; British use probe in nose.

Research on gust alleviators is paying off with concrete designs on both sides of the Atlantic.

Here in the U. S., the Air Force and Douglas Aircraft Co. cooperatively have developed a device—a simple mechanical linkage to aileron—to relieve gust-caused airloads. And flight tests on a C-47 at Douglas' Santa Monica plant are reported to have convinced engineers there of the feasibility of the installation. In England, Boulton Paul Aircraft Ltd. has developed an alleviator which is being flown in a Lancaster.

Aside from the benefits of safety afforded by the alleviator, according to CADO Technical Data Digest, relief of gust effects will make possible a lightening of structure, resulting in appreciable operational benefits.

▶ **Benefits**—It reports that engineers concerned with the development feel that in a cargo plane with a gross of 100,000 lb., use of the alleviator would permit a cut in weight of the basic structure of 2,000-3,000 lb.; or it could make possible an increase in level flight speed of as much as 25 percent—an appreciable gain in the case of a 300-mph. plane.

Cutting the structural weight of the plane would give greater range for the same amount of fuel; or if the weight reduction is put back as fuel even greater range is obtained; or the weight reduction can be carried as additional payload for the same distance.

▶ **How It Operates**—The AF-Douglas gust alleviator, according to CADO, works this way:

When an upward gust hits the plane, the wings bend upward, the deflection being converted through a mechanical linkage to aileron motion, causing the aileron to rotate up. Amount of rotation is determined by a fixed ratio to the amount of wing deflection. The up-aileron reduces the airload on the wing for a relieving effect. For a downward gust, the aileron is deflected down for a similar effect.

Aileron motion from the gust alleviator is superimposed on that required to roll the plane, the alleviator on each wing acting independently on its own aileron.

▶ **English Scheme**—The English installation appears more complicated than the Air Force-Douglas-developed arrangement.

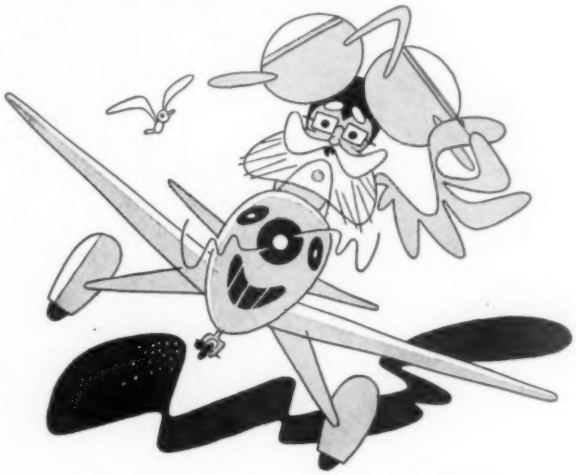
The gust detector itself, according to the British publication The Aeroplane,

(*Continued on p. 53*)

The Birdmen's Perch

Watch 'er, Grampa, she's a rarin'!

Though this may come as something of a shock to you young buckos, flying isn't just for kids!



Fact is, there are a few active pilots over 80 and thousands more over 60.

And here's the pay-off! CAA records show that student pilots (we use the term advisedly) between 50 and 55 are the safest pilots of all—with a safety record five times better than that for student pilots in the 20 to 25 age group.

Next time you see a flowing white beard where a flying scarf should be, step aside, Junior—there goes a real flyer!

SPEAKING OF OLD-TIMERS—

Here's some sage advice about trouble-free flying! Gulfpride

Aviation Oil—Series D—is just the shot in the crankcase your plane needs!

It's the finest detergent dispersant oil for horizontally opposed engines there is—the only aviation oil put through Gulf's exclusive Alchlor process to remove those extra carbon and sludge formers!

Ask for Gulfpride Aviation Oil—Series D—and increase periods between overhauls up to 100%!

GULF

AVIATION PRODUCTS

BE SURE YOUR GAS CAP IS ON TIGHT IN FLIGHT...
OR THE AIR MIGHT SIPHON OUT AND WASTE PRECIOUS GALLONS OF THAT...
SUPERPOWERFUL GULF AVIATION GASOLINE!
R.COE

Gulf Oil Corporation . . . Gulf Refining Company

ONE ENGINE DOES THE WORK OF FOUR: In its successful flight tests, a single T-34 Turbo-Wasp powered a Flying Fortress with all four of its regular 1,200 h.p. piston engines cut out. The T-34 has been selected to power an advanced version of the C-124 Douglas Globemaster.

Performance of Two Powerful New Turbo Engines —Designed, Developed and Built by Pratt & Whitney—proves once again that:

"All the Years of Work are worth it when the Prize is Air Supremacy"

SOON Pratt & Whitney Aircraft will undergo a major plant expansion—the primary goal of which will be the accelerated production of its two new power plants, the J-57 and the T-34.

AND ANOTHER STEP will have been completed in a tremendous undertaking that started back in 1945.

THEN IT WAS that Pratt & Whitney laid down its first, *independent*, designs for high-powered axial-flow gas turbine engines. Since then, six years of engineering effort and thousands of man hours have been spent on their development.

TODAY THOSE ENGINES are ready to be committed to volume production. The performance of both has been so outstanding that they have *already* been ordered in substantial quantities by the Armed Forces . . . and are destined to play an important part in maintaining air supremacy for this nation.

T-34 Turbo-Wasp: The most powerful propeller-turbine engine now flying in either the U. S. or England, the T-34 is rated from 5,000 to 6,000 h.p. Developed under U. S. Navy, the T-34 delivers 90% of its power to the propeller shaft with the remainder in jet thrust. It has a higher power-weight ratio and lower fuel consumption than any engine in this category.

J-57 Turbo-Wasp: A very advanced turbo-jet, the J-57 is demonstrating performance characteristics, particularly with regard to fuel economy, substantially superior to those of any other turbo-jet engine known to be in a similar stage of development. Developed under Air Force sponsorship, the J-57 has been chosen for vital military aircraft installations that remain classified.

Pratt & Whitney Aircraft

PRATT & WHITNEY AIRCRAFT — DEPENDABLE ENGINES

ONE OF THE FOUR DIVISIONS OF
UNITED AIRCRAFT CORPORATION
EAST HARTFORD, CONNECTICUT

is light weight

important to your product?

Torrington Needle Bearings contribute to weight-and-space-saving design in many products.

For any given load, Needle Bearings weigh less and require less radial space than any other type of anti-friction unit.

Needle Bearings also permit weight savings in related components. Only a bore machined to proper dimensions is required for the housing and no spacers or retainers are needed.

So, if your product can benefit from light weight, let our engineers help you utilize the weight- and space-saving advantages of Torrington Needle Bearings.

THE TORRINGTON COMPANY

Torrington, Conn. • South Bend 21, Ind.

District Offices and Distributors in Principal Cities of United States and Canada

TORRINGTON *NEEDLE* BEARINGS

NEEDLE • SPHERICAL ROLLER • TAPERED ROLLER • STRAIGHT ROLLER • BALL • NEEDLE ROLLERS

(*Continued from p. 48*)
is mounted ahead of the plane's nose and linked to the ailerons to give automatic correction as the gust is entered.

The probe is an electro-manometric transducer which detects vertical components of gust pressures, known as gust signals. Difference for signal demand for aileron, and the then actual aileron position is amplified and converted into mechanical displacement. This is fed to an electro-hydraulic power control unit and superimposes the required gust correction on the ailerons, independently of control exercised by the pilot.

For maximum effect, aileron correction must be applied as the gust acts on the wing; hence, there must be a time lag between detection by the transducer and aileron operation. This lag—of the order of 0.1 sec.—is a function of detector-wing separation and airplane speed.

While an automatic transmission delay correction to compensate for variations in airspeed probably will be fitted in future developments, in the experimental installation, transmission time of the entire system can be varied with respect to dynamic pressure to permit study under all conditions of speed and transmission delay.

Reports are that the air trials with this gust alleviator have produced satisfactory results.

Engineering Group Gloomy Over Supply

The total number of engineers of all kinds available to industry this year is about 19,000. The minimum need has been estimated at 30,000. And the situation will become more critical during the next three years.

These appalling facts are the sum and substance of a recent release from the Engineering Manpower Commission of the Engineers Joint Council.

The Commission queried 135 engineering colleges which are accredited by the Engineers Council for Professional Development, and on the basis of a 64 percent return to the questionnaire, drew these conclusions:

- **The total number** of engineering graduates this year is about 38,000.
- **The number to be commissioned** in the armed forces or reserves is about 4,200.
- **The number who are enlisted** members of reserve or National Guard is about 6,100.
- **The number of draft eligibles** is about 13,700.

In adjusting these totals to reflect the numbers who will actually be called into active duty or drafted, the Commission stated that:

- **All of the graduates** who are to be commissioned as a result of ROTC training and about half of those who are enlisted members of the reserves or guard units will be called to active duty promptly.
- **The percentage of 4Fs** will reduce the number of draft eligibles only slightly, to a total of about 11,800.
- **If Selective Service System** inducts the draft eligibles, and there are indications that every effort to do so will be made, there will be a total of only about half of this year's graduating class available.

Thus, the total number of engineering graduates which can be counted on as available to industry th does not exceed 19,000.

This may not come as news to personnel directors throughout the country who have been making desperate efforts to corral the current engineering talent. Nor will it be any solace to them to find that this year's group is smaller than previously hoped. And adding the final stroke is the statement by the Commission that a previous survey showed that 25 percent of the engineers now employed in industry are enrolled in the reserves, and that some of these men will be lost to the services.

An earlier study made by AVIATION

How can this TINY TAB . . .
make a jet fly better?
Just a small flow-detector tab below the leading edge, yet this vane gives any airplane better landing, flight, and maneuvering characteristics, regardless of size or weight. It's part of the stall sensing unit of the Safe Flight pre-stall instrumentation system.
Regardless of load, speed, acceleration, or flap position, this detector gives infallible pre-stall warning at a precisely determined margin. It actuates the Safe Flight control shaking device which perfectly simulates natural buffeting so difficult to achieve in modern, rigid, high-speed aircraft. Equally important, it helps the pilot obtain maximum performance by supplementing his perceptive skill in the region of $C_{L(max)}$.
Why not let our engineering staff discuss what stall instrumentation can do to improve your designs? Your inquiry will be welcomed.
SAFE FLIGHT SYSTEMS ARE INSTALLED ON THESE AIRCRAFT
TRANSPORT Convair 240
Douglas Super DC-3 Northrop C-125
CIVILIAN Aeronca (all models)
Beech 18, 35 Cessna (all models)
Piper (all models)
TACTICAL AIRCRAFT
Chance Vought F7U series
Douglas AD-3W series, F3D series
Grumman (all models)
McDonnell F2H series
Northrop F89, YRB-49 series
SAFE FLIGHT INSTRUMENT CORPORATION
White Plains, New York
PIONEERS IN STALL INSTRUMENTATION

Thrill to the conquest of the skies—the adventure and drama of 25 years' air travel growth

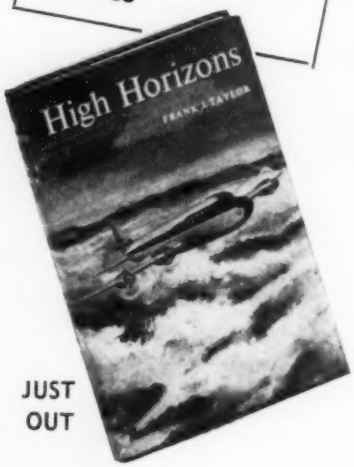
in this vivid "life story" of one of the nation's great airlines

HIGH HORIZONS

The United Air Lines Story

By Frank J. Taylor

$4.00



JUST OUT

IF you were an early-day air passenger, you rode in the box-like cabin of a single-engined plane, dined on a sandwich and apple, spent thirty-two hours or longer, flying from coast to coast.

Today, you can ride in pressurized cabins of four-engined airliners, delight in full-course meals, make that same coast-to-coast trip in less than ten hours, and enjoy all the comfort, speed, and dependability that characterize air travel today.

Behind this development of the air transport industry lies a spine-tingling saga of courage and hard work—a dramatic tale of people and events that is sure to give you both entertainment and information.

This new book, written by a famous journalist, tells the story in vivid word and picture form. Here, as seen through the growth of United Air Lines, is recaptured all the glory and spirit of the air transport industry — from the early, adventurous days of barnstorming, hedge-hopping pilots who flew by the seat of their pants, to the present-day deluxe airliners.

CONTENTS: The Daredevil Flying Postmen • The Western Pioneers • West Meets East at Chicago • The First Air Transport Giant • Who's Flying This Plane? • Air Transport's Pied Piper • The Air Mail "Purge" • United Unshackled • The Modern Magic Carpet • War Wings • Chaos on the Airways • People Make an Airline • Flying High, Wide, and Handsome.

AT YOUR BOOKSTORE
or
SEND COUPON FOR 10 DAYS' FREE EXAMINATION

McGRAW-HILL BOOK CO.
330 W. 42nd St., New York 18, N. Y.

Send me Taylor's **HIGH HORIZONS** for 10 days' examination on approval. In 10 days I will remit $4.00, plus few cents for delivery, or return book postpaid. (We pay delivery on orders accompanied by remittance; same examination and return privilege.)

(PRINT)
Name .....

Address .....

City .....Zone.....State.....

Company .....

Position AW-6-18

(This offer applies to U. S. only)

WEEK (May 7, p. 26) showed that most members of the graduating classes this year already had accepted job offers. That study further concluded that there would be no increases in the numbers of engineering graduates over the next five years, and perhaps even longer.

The release from the Commission further underscores that viewpoint. The industry can hope only to relieve the engineering shortage, not to eliminate it.

NACA Reports

► **Creep of Lead at Various Temperatures (TN 2322)—by Peter W. Neurath and J. S. Koehler (Carnegie Institute of Technology).**

This investigation was started to obtain stress-strain curves, creep data and elastic constants for single crystals of lead over a wide range of temperatures. It was conducted at the Carnegie Institute of Technology with financial assistance from the NACA.

Although the subject may seem far removed from practical application in aviation, it must be remembered that the mechanism of creep is not completely understood. It must be further remembered that creep is one of the most severe problems in the selection of metals for high-temperature operation.

Consequently, by studying the creep process for lead under test conditions which are far easier to obtain than those representative of gas-turbine operation, for example, analogies can be drawn between the behavior of lead and other metals.

The report should be considered in this light.—**DAA**

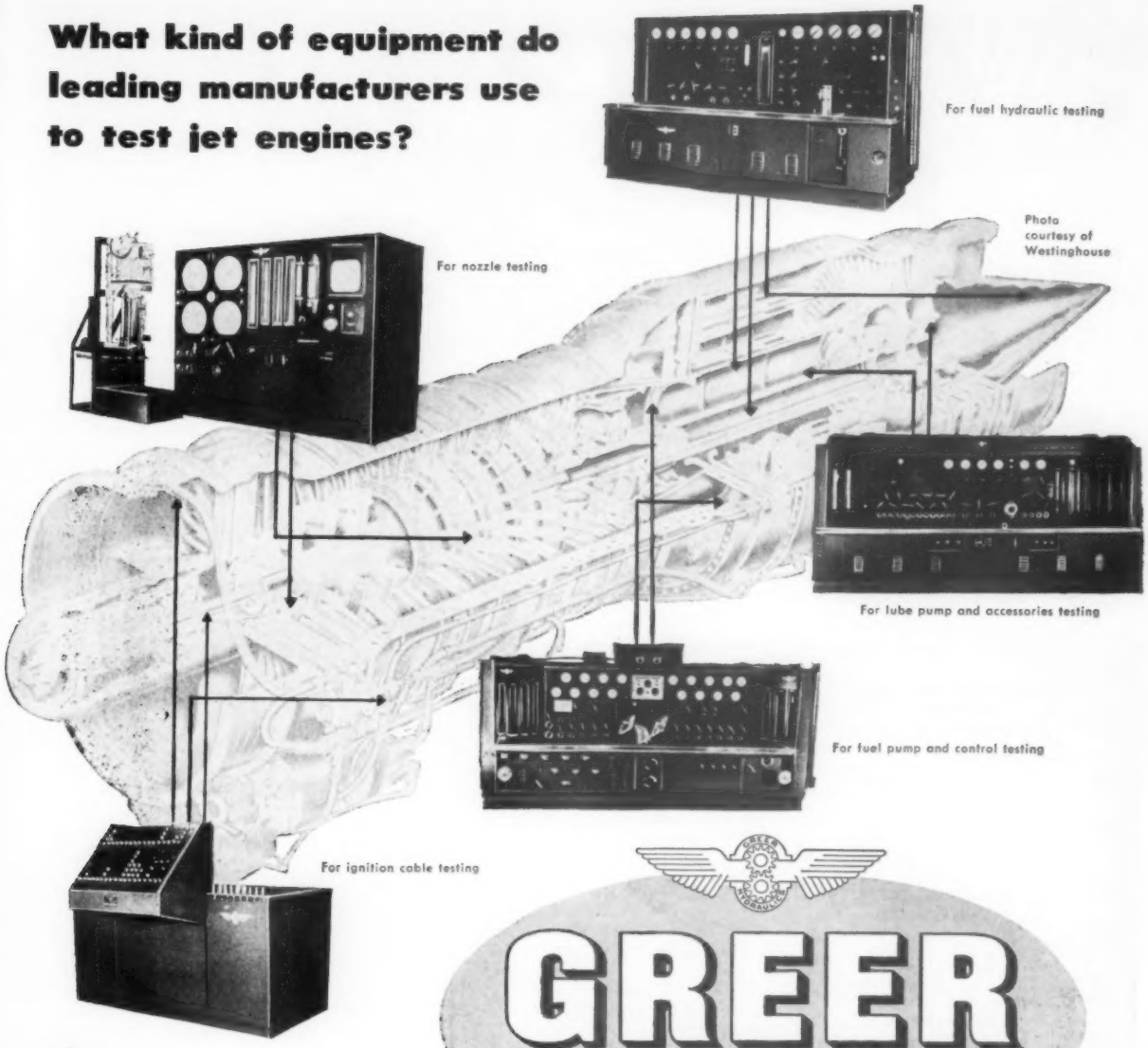
► **Fatigue Testing Machine for Applying a Sequence of Loads of Two Amplitudes (TN 2327)—by Frank C. Smith, Darnley M. Howard, Ira Smith and Richard Harwell (National Bureau of Standards).**

Two nominally identical machines were constructed which are capable of subjecting sheet-metal specimens to a prescribed number of cycles of axial fatigue load, automatically changing the load amplitude for another prescribed number of cycles, and repeating the loading schedule until failure of the specimen.

These machines make possible the systematic study of the effects of a wide range of stress-cycle combinations on the fatigue strengths of sheet materials. The machines can apply pulsating as well as completely reversed axial loads.

The machines were constructed at NBS under sponsorship and with financial assistance from NACA.—**DAA**

What kind of equipment do leading manufacturers use to test jet engines?


For fuel hydraulic testing
Photo courtesy of Westinghouse
For nozzle testing
For lube pump and accessories testing
For fuel pump and control testing
For ignition cable testing

GREER TEST EQUIPMENT

WHAT *"creative engineering"* MEANS AT GREER

1. Design Engineering . . . a staff of top designers with many years of experience in design of precision test equipment.

2. Production Engineering . . . manufacturing experts who know and use the latest methods for building absolute accuracy into quality test equipment.

3. Service Engineering . . . field representatives who are *authorities* on the servicing of aircraft accessories and systems.

Leading manufacturers of flying powerplants, turn to Greer equipment for:

1. **Simple, rapid testing**
2. **Extreme accuracy**
3. **Absolute dependability**

Careful testing right down the production line is indispensable to the manufacturer of jet aircraft engines. Designing and building this test equipment is a job for specialists in a specialized field.

Who has this hard-to-find experience? Greer has it in full measure – and makes use of it to produce test machines of almost incredible accuracy. Little wonder that aircraft engine manufacturing choose Greer.

For Greer has developed a complete line of aircraft maintenance and test machines to service all systems and components of all aircraft. To meet specific testing requirements, many special machines have been designed – a staff of *creative engineers*® is waiting to talk over your problem at your convenience.

Please feel free to call on us. There is no cost or obligation. Write Greer today.

GREER HYDRAULICS INC. · 452 EIGHTEENTH STREET · BROOKLYN 15, NEW YORK

Field Office: Greer Hydraulics, Inc., 298 Commercial Building, Dayton, Ohio

Representatives: Thomson Engineering Service, 708 Hemphill St., Fort Worth 4, Texas • Harold E. Webb, 918 N. Kenilworth Ave., Glendale 2, Calif. Daun & Bleck, Rua Dos Fanqueiros, 262,1.° Lisbon Portugal • Astra Aircraft Corp., 29-31 Simmonds St. Ext., Johannesburg, South Africa

New Book!

LATEST INFORMATION ON

MAGNESIUM

alloys • forms
properties
sizes
tolerances

TABLE OF CONTENTS

DOWMETAL ALLOYS
- Specifications
- Grades

PROPERTIES

PHYSICAL PROPERTIES
- Specific Gravity
- Thermal Expansion
- Thermal Conductivity
- Electrical Properties
- Thermal Stability

MECHANICAL PROPERTIES
- Tensile Properties
- Compressive Properties
- Shear
- Bearing
- Modulus of Elasticity
- Modulus of Rigidity
- Poisson's Ratio

CHEMICAL PROPERTIES

PRODUCTS MANUFACTURED
- Primary Magnesium
- Alloy Ingots

CASTINGS

SAND CASTINGS
- Grades
- Alloys
- Tolerances
- Patterns
- Inserts
- Heat Treatment
- Finish

PERMANENT MOLD CASTINGS
- Alloys
- Design
- Dies
- Heat Treatment

CASTINGS—Cont'd

DIE CASTINGS
- Alloys
- Design
- Dies
- Sizes and Tolerances
- Finish

EXTRUSIONS
- Grades
- Alloys
- Dies
- Finish
- Definitions
- Lengths

ROUND RODS, BARS and STANDARD STRUCTURAL SHAPES
- Sizes and Weights
- Tolerances

TUBING
- Sizes and Weights
- Tolerances

FORGINGS

SHEET, PLATE and STRIP
- Grades
- Alloys
- Finish
- Sizes and Weights
- Tolerances

MELTING FLUXES and AGENTS
WELDING ROD and FLUXES
SOLDERS

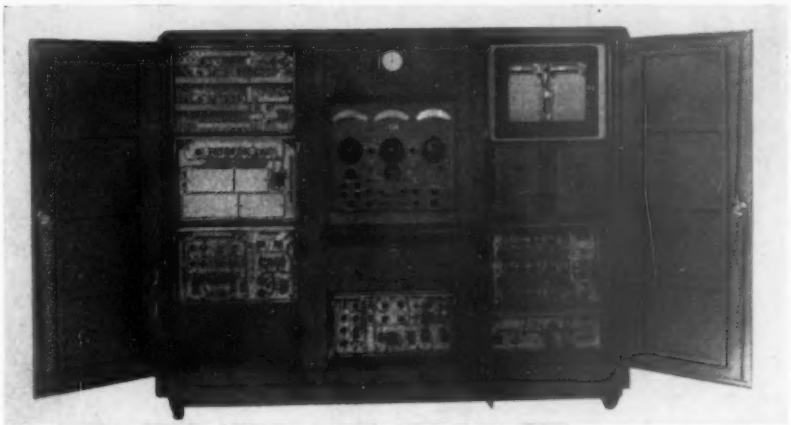
Here is a handy compilation of the latest information on Magnesium Alloys and Products. The purpose of this book is to acquaint the reader with the forms in which magnesium is manufactured and to provide information on properties, sizes, tolerances and other significant data.

If you are using magnesium now, or contemplate using it in the future, you will find this handbook of vital importance. For your copy of "Magnesium Alloys and Products" simply write to Dept. MG-151, using your company letterhead.

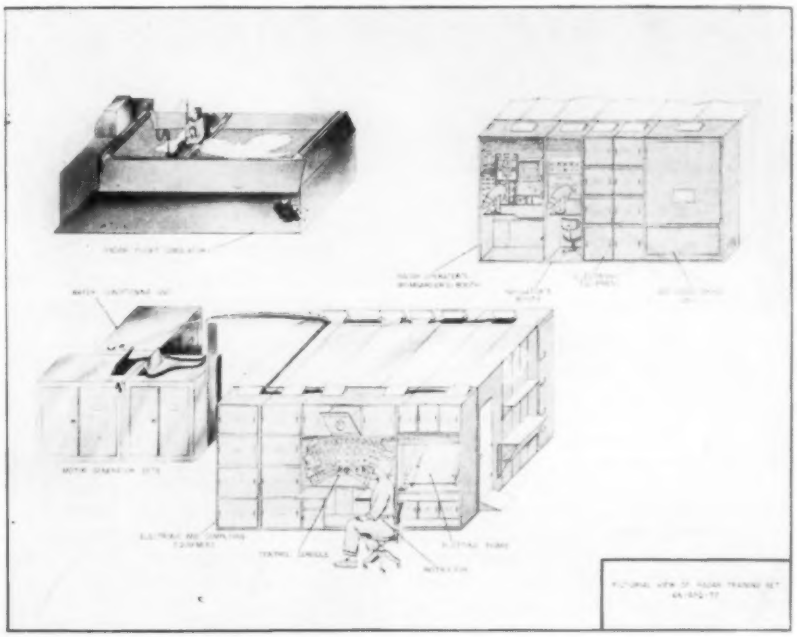
MAGNESIUM DIVISION

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

New York • Boston • Philadelphia • Washington • Atlanta • Cleveland • Detroit • Chicago
St. Louis • Houston • San Francisco • Los Angeles • Seattle
Dow Chemical of Canada, Limited, Toronto, Canada



TAIL GUNNERS get targets and trouble from instructor's panel in center of cabinet.



NAVIGATORS, BOMBERS practice on this air-transportable training unit.

New Radar Trainers for USAF

Production stage reached on avionic devices to school tail gunners and navigators and bombardiers.

Once-simple avionic devices to train pilots have sired a whole family of complex, highly realistic units to train each member of an air crew. Two of the best examples are just being put into production by Transducer Corp., Boston.

One is the AN/APG-T1 gun-laying radar trainer for tail gunners; the other is the AN/APQ-T2 navigational-bombing trainer. Having worked for years to develop prototypes of the two devices, Transducer now has orders totaling more than $18 million for production versions.

▶**Gun-Laying Trainer**—The brains of the gun-laying trainer are in a massive 60-cu. ft. cabinet with the instructor's panel in the center. From here he can place on the gunner's radar screen one or two blips representing attacking planes at various ranges and angles of

REFRASIL

provides the

3 essentials OF INSULATION EFFICIENCY FOR JET PROPELLED AIRCRAFT

1 *Ideal insulation must be light in weight and bulk.*

REFRASIL batt has a surface density of .05 lb. per sq. ft. and a nominal thickness of 3/4 in. Pre-fabricated blanket for typical jet tailpipe is only 1/2 in. thick. REFRASIL is resilient—will not pack down or disintegrate under vibration.

2 *Ideal insulation must reduce temperature to safe level for structure and personnel.*

REFRASIL pre-fabricated removable blanket with nominal thickness of 1/2 inch, will give a temperature drop from high of 1300° F. to low of 300° F. REFRASIL will withstand sustained exposure to temperatures up to 1800° F. and flash temperatures of 400° F. more, without breakdown.

3 *Ideal insulation must be easy to install and remove from equipment.*

REFRASIL is available as pre-fabricated removable blankets, preformed to any desirable specifications. Insulating efficiency of REFRASIL Blankets is not affected by frequently repeated removal and installation operations.

90% of JET AIRCRAFT MANUFACTURERS use:

REFRASIL

REPRESENTATIVES:

Eastern: Fred W. Muhlenfeld, 5762 Maplehill Road, Baltimore 14, Md., Hamilton 8146

Northwest: J. Lawrence Larsen, 3608 Shubert Place, Seattle 22, Wash., East 2704

Mail coupon for free illustrated data

HI-CO

The H. I. THOMPSON COMPANY
1731 Cordova Street
Los Angeles 7, Calif.

☐ Please send free illustrated REFRASIL DATA.

☐ Please send bulk fiber / batt / textile sample of REFRASIL.

Name_____

Position_____

Company_____

Address_____

City_____ Zone____ State_____

ENGINEERS
DESIGNERS
PHYSICISTS

THE Aerophysics & Atomic Energy Research Division of North American Aviation, Inc. offers unparalleled opportunities in Research, Development, Design and Test work in the fields of Long Range Guided Missiles, Automatic Flight and Fire Control Equipment and Atomic Energy. Well-qualified engineers, designers and physicists urgently needed for all phases of work in

Supersonic Aerodynamics,
Preliminary Design & Analysis,
Electronics,
Electro-Mechanical Devices,
Instrumentation,
Flight Test,
Navigation Equipment,
Controls,
Servos,
Rocket Motors
Propulsion Systems,
Thermodynamics,
Airframe Design,
Stress & Structures.

●

Salaries Commensurate with training & experience.
Excellent working conditions.
Finest facilities and equipment.
Outstanding opportunities for advancement.

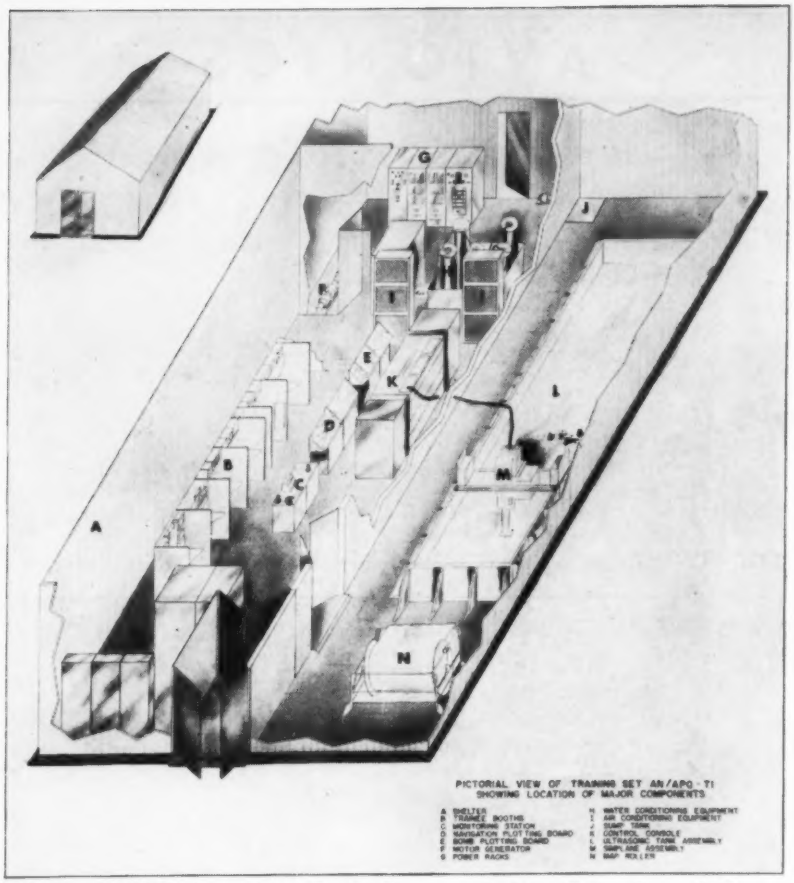
●

Write now—Give complete resume of education, background and experience

●

PERSONNEL DEPT.
AEROPHYSICS & ATOMIC ENERGY RESEARCH DIVISION

NORTH AMERICAN AVIATION
INC.
12214 LAKEWOOD BLVD.
DOWNEY, CALIFORNIA



LARGE TRAINER for navigators-bombardiers is a fixed installation for multiple use.

elevation and azimuth, and record rounds fired and results.

One index to the complexity of the trainer is its more than two miles of wire and 110 vacuum tubes. But an even better example is its operation.

Behind each of the two closed doors on the right side of the control cabinet is a pin-point light source directed by a mirror and a rotating prism onto strips of paper. The paper is divided vertically into three sections: for azimuth, range and elevation. Through each segment a ragged line running from top to bottom represents various attitudes of an aircraft.

The light scans these lines and each time it crosses a line it transmits a pulse to the remotely located trainee's gun-sighting scope. The blip indicates the position of an attacking plane.

Using the three large dials with the scaled indicators above them, the instructor changes the attacking "plane's" attitude. The cross pointer under the center dial shows how well the trainee is doing in getting the attacker in his sight. The clock at top of the cabinet ticks off the time it takes the trainee to get locked on the target.

Other indicators, lights and buttons on the panel are used to introduce jamming and fading signals, register rounds fired, hits scored and other information. The instructor can use both light sources and strips of paper to put two targets on the screen simultaneously, or he can switch from one to the other and gauge the student's ability to switch targets.

A permanent record of the trainee's reactions to all instructions is made.

► **Navigator - Bomber Trainer** — Transducer's navigational-bombing trainer is based on the principle that the speed of sound in water is 1/200,000 the speed of electromagnetic waves in air. Thus a terrain contour map scaled 200,000 to 1 is submerged in purified water held to a constant temperature. This method has been used for some time by USAF's School of Aviation Medicine at Randolph AFB to check on radar interpretation (AVIATION WEEK Mar. 19, p. 39).

In the Transducer application, the map is submerged in a tank and above the map, but also submerged, is a simulated radar antenna which can be maneuvered by the instructor to any position above the map. This antenna represents the plane in flight.

As the antenna emits sound pulses at ultrasonic frequencies, the pulses strike the map and are reflected back, picked up and converted to radar signals

on the trainee's scope. The instructor can feed into the system simulated ground-based radar beacons and jamming signals.

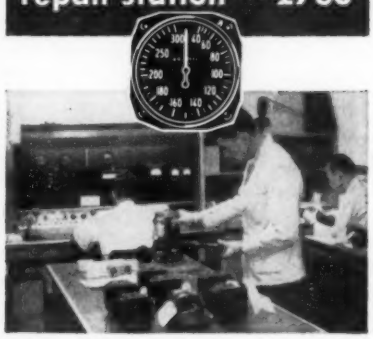
Two plotting boards are used by the instructor to determine a student's ability. One is scaled to correspond to the size of the map and shows the navigator's performance. The other records the flight of the aircraft in the target area and shows the bomb release point and the impact point.

This trainer has a variety of potential uses in addition to routine training of bombardiers and navigators. One possible use is for briefing of air crews on the terrain over which they will fly or rehearsing an actual bombing mission.

▶ **Two Versions**—Transducer is now producing two versions of this trainer, the -T1, a fixed installation with a tank 9 x 36 ft., in which can be simulated the terrain in an area of nearly 500,000 sq. mi., and the -T2, a portable trainer with a tank 6 x 9 ft., which can simulate a 75,000-sq. mi. area.

The -T2 trainer can be dis-assembled and moved by air to forward bases where it can be set up in eight to 12 hours. It can be used for the same purposes as its larger counterpart with the exception that there is a training station for only one navigator or bombardier instead of the battery of training booths in the -T1.

CAA approved instrument repair station NO. 2783



Instruments and accessories reconditioned and standardized in our modern, fully equipped and technically staffed laboratory.

inquiries invited

from foreign or domestic airlines and base operators

Standard Products Inc.

650 East Gilbert • Wichita, Kansas

MELETRON'S
PRESSURE ACTUATED SWITCH
Model 715
Controls **PRESSURIZATION**

This aneroid unit is ideally suited to control cabin pressurization, electronic equipment housing pressurization or any system requiring response at a pre-set altitude. It is available with dual circuits, *in one unit*, for control at different altitude settings. Where space is limited, Model 715 can be sealed and mounted away from the pressurized area for remote control.

Designed to meet applicable AMC environmental and qualification requirements. Explosion proof as per USAF specification 41065B.

Northwest: J. M. Walthew Co., Boeing Field, Seattle. **East:** Russell & Co., 10 S. Union St., Bay Shore, N. Y. Also 127 Crosby Ave., Buffalo, N. Y. **South:** Thomson Engineering Service, 708 Hemphill St., Fort Worth.

MELETRON CORPORATION
930 NORTH HIGHLAND AVENUE, LOS ANGELES 38, CALIFORNIA

High pressure switches to 12,000 psi — Vacuum switches — Differential pressure switches — Rotary selector switches — Solenoids.

"That's the Engineer who Specified Parker *Die Castings!*"

FIRST of all, this engineer saw the value of using the Die Casting technique for that difficult part. Even though the run was small, considerable savings were realized since no machining or finishing operations were necessary. He knew that Parker was the right choice to produce the casting, for Parker devoted almost their entire output to the aircraft industry during the last war. They became "aviation specialists," so to speak.

Parker is one of the oldest names in Die Castings. Our entire effort here is in the production of die cast parts for literally all types of industries.

Call in Parker engineers on your next quotations.

And when you think of Die Castings **- - THINK OF**

Parker White Metal Company • 2153 McKinley Ave. Erie, Penna.

PARKER ALUMINUM *and* ZINC *Die Castings*

FINANCIAL

Copters Lure Speculating Public

Despite financial history, the rotary-wing industry's favorable outlook is reflected in market interest.

Investment interest in helicopter securities continues to broaden and is being reflected in new financing.

The recent public sale of $2,500,000 in 5 percent convertible income debentures by Hiller Helicopters is another manifestation of the broadening public participation in the helicopter industry.

The strong speculative lure of this new aviation development greatly facilitated the sale of the Hiller debentures. While the company has pioneered helicopter types of its own and is now a major factor in the industry, it is completely lacking in a past record of profitability. To be able to market a new issue of securities in the face of development costs and operating deficits is a signficant accomplishment.

▶**Hiller History**—Hiller Helicopters is the successor name of the business incorporated as United Helicopters, Inc. in December, 1945. During the years 1946 to 1948, the company was in the development stage prior to starting commercial production. All of its operating expenditures were capitalized as helicopter development costs during these initial three years. With the start of commercial production in 1949, certain additional tooling, engineering, research and patent costs were capitalized in both 1949 and 1950.

Nevertheless, Hiller experienced operating deficits in 1949, 1950 and thus far in 1951. For the year ended Dec. 31, 1949, the net loss amounted to $372,021. For 1950, the net loss aggregated $307,415. In the two months ended Feb. 28, 1951, a net loss of $14,433 was experienced. The management also expressed the opinion that its losses for March and April will exceed that of the first two months. Of the company's total resources of $3,086,014 at Feb. 28, 1951, $1,227,567, or more than one-third, represents research and development costs to be amortized against future years' operations.

▶**Debenture Conversion**—The debentures are made attractive through a conversion feature. While a senior position in the capital structure is thus obtained, an avenue is provided to participation in any mounting profitability that may accrue to the common stock. The conversion on the debentures is at the rate of $10 per common share up to May 2, 1956, and at higher rates thereafter. These debentures will be used to retire $725,000 in secured debt and to provide additional working capital.

Hiller had 350,000 shares of capital stock outstanding Feb. 28, 1951. Of these shares, 250,000 were sold at $10 per share. The remaining 100,000 shares were issued to Stanley Hiller, Jr., in exchange for his business and assets acquired by the present corporation. These 100,000 shares are held in escrow in keeping with the order of the California Corporation Commissioner under certain conditions.

In addition, a total of 65,000 warrants were issued initially to the underwriters, Blyth & Co. and Lehman Brothers, as additional compensation. These warrants are exerciseable at an initial rate of $10 per share, changing in subsequent years to match the conversion rate of the debentures.

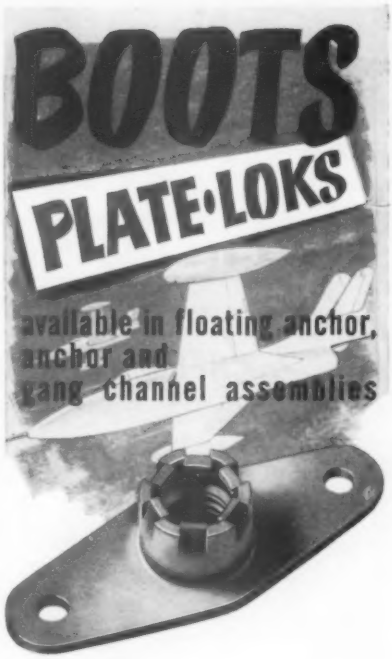
It is also contemplated by the management that 35,000 shares may be made available to certain officers and key employes at $10 per share. This has, however, not been done as yet.

Accordingly, if all of these shares are issued and converted at existing rates, a total of 600,000 shares of common stock will be outstanding. Any earnings —or losses—that may develop will be against this projected capitalization.

As a practical matter, Hiller now has a total capitalization of some $4,740,000, represented by debt and common stock. Total military backlog was last reported at approximately $18 million. It will be necessary for the company to convert this backlog, together with such new business as it may obtain, into completed deliveries before an approach to earnings may be made. The degree of profitability achieved will determine how well its capitalization may be supported.

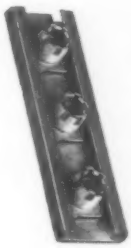
▶**Piasecki Story**—Another major factor in the industry, Piasecki Helicopter Corp., appears to have completed its earlier financing steps. About a year ago, in order to obtain additional capital, the company sold a total of $300,000 in five-year convertible notes.

Due to the company's rapid development and impetus accorded the helicopter as a result of initial experiences in the Korean war, a sharp market appreciation took place in the Piasecki common stock (AVIATION WEEK Jan. 22, 1951). As indicated at that time, this provided a favorable background



ANCHOR BASES

Plate-Loks in anchor bases to meet your every requirement—plain anchors, one-lug, corner, midget, right angle. The all metal Plate-Lok is fully approved under AN-N-5 and AN-N-10. Its positive locking action is proof against vibration and structural breakdown due to radical temperature changes.



GANG CHANNEL

The unique Plate-Lok Nut assembled into straight channels; removable or permanently attached nuts. Standard-length channels in a wide range of nut spacings are available; special lengths and spacings can be supplied to your order.

FLOATING ANCHOR

Now in one-lug, two-lug, and right-angle bases — for regular or countersunk rivets, for welding — permanently assembled or with removable nuts. For anchor applications where float is desirable — specify Plate-Lok!

PROBLEMS?
Tell us about your lock-nut problems. We'll supply experimental quantities free.

CATALOG
Write for your free copy NOW!

BOOTS

Boots Aircraft Nut Corp.
STAMFORD, CONNECTICUT

ARO

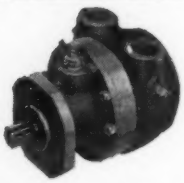
PRECISION Aircraft Products

. . . built with years of know-how!

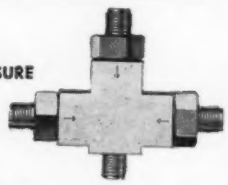
√CHECK YOUR NEEDS!

☐ OXYGEN REGULATORS O-616-A

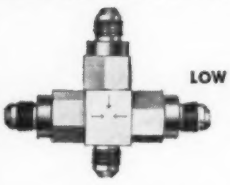
☐ VACUUM PUMPS A-505-DD



☐ HIGH PRESSURE CHECK VALVES 9755

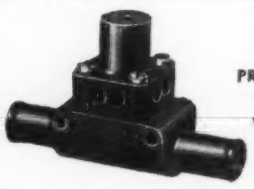


☐ LOW PRESSURE CHECK VALVES 9810

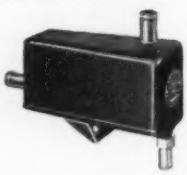


☐ SUCTION RELIEF VALVES 9450

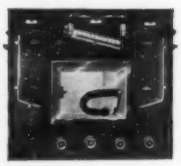
☐ PRESSURE SAFETY VALVES 9740



☐ OIL SEPARATORS A-512-A



☐ OXYGEN TESTING EQUIPMENT OT-122



☐ ELECTRONIC ICE DETECTOR

☐ LIQUID OXYGEN CONVERTERS

☐ HYDRAULIC MOTORS

Aro Engineering "won its wings" before World War II . . . designing and building precision instruments and devices widely used in aircraft.

Today—Aro's years of experience and modern facilities are important to users of aircraft products such as these. Whether it's oxygen regulators . . . vacuum pumps . . . check valves . . . or other units . . . ARO builds 'em *right* for *precision* and *performance!* Send for complete information. The Aro Equipment Corporation, Bryan, Ohio.

ARO **AIRCRAFT PRODUCTS**

ALSO . . . AIR TOOLS . . . LUBE EQUIPMENT GREASE FITTINGS

for forcing conversion of the notes by calling them for payment a few months ago. In the process a total of 24,000 additional common shares were created and the $300,000 debt eliminated.

Piasecki has shown profitable operations in each of the past three years. Its earnings gained steadily from $65,657 in 1948, to $105,946 in 1949, and to $150,497 in 1950. In broadening its financial pattern, the company also declared a two-for-one stock split shortly after calling the notes for redemption and forcing their conversion. As a result, instead of the 140,719 shares outstanding at the 1950 year-end, the total common stock now outstanding is around 330,000 shares. Instead of the peak quotations of around $40 per share for the old stock at the height of the Korean helicopter boom, present market prices for the new stock are around $14 per share. (This is equivalent to around $28 for the old stock.)

It is significant that Piasecki does not show any deferred development costs in its balance sheet to be amortized against future operations. Such experimental research and development charges appear to be absorbed on a current basis. The company's backlog was last indicated at more than $100 million, up substantially from the $10 million reported at the 1949 year-end. With expanding productive facilities, deliveries may be expected to mount considerably. Here too, the ultimate extent of profitability will be determined when the completed results are totaled.

▶ **Competitive Industry**—While Hiller and Piasecki are exclusively manufacturers of helicopters, they are by no means the only ones in the industry.

Well established in the helicopter industry are a number of old-line aircraft builders whose major pursuits, relatively at present overshadow their helicopter products.

In this group are Bell, Sikorsky division of United Aircraft, and McDonnell. It is difficult to assign a percentage of the total volume of activity in each instance representing the helicopter operations. All three of these companies, however, have "substantial" military contracts for their helicopter designs and are aggressively pursuing engineering research and development in even more advanced models.

There are other companies with engineering designs for helicopters who are very hopeful of persevering with a model that will prove acceptable to the military and hence lead to substantial military contracts with an ultimate entree to a commercial market whose depth remains unknown.

It is these factors which will continue to make the market for helicopter securities an intriguing one for some time to come. —Selig Altschul

It's Rugged... Roomy... Comfortable!

Cessna 170

IT'S AMERICA'S LOWEST PRICED 4-PLACE, ALL-METAL PLANE...

by Several Thousand Dollars

WHAT DO I WANT IN MY NEW AIRPLANE?

1. *All-metal construction? A must.*

2. *High cruising speed with economy? Definitely.*
Open it up side by side with any other new airplane under $12,000. You will get more miles per gallon at high cruising speed than anything else in its class. Check results of recent efficiency races.

3. *Big enough so 4 adults travel in comfort? Yes.*
Room for four adults to ride several hours in comfort, plenty of leg room in rear and front seats.

4. *Low noise level? Yes.*
Try conversing during flight from front to rear seats in normal tones, again the best.

5. *Abundant pay load? Yes.*
Carry four people, and baggage and gas for a 500-mile jump (full tanks of gas). You can do this safely in the Cessna, without exceeding the C.A.A. certified pay load of the airplane.

6. *Over-all reliability? Yes.*
Rugged construction, spring steel landing gear, proven power plant, built-in quality, backed up by years of experience building fine airplanes.

Examine the Cessna 170 from propeller to rudder—you will find outstanding quality throughout... very rugged construction... performance to easily handle the job.

During 1950, the Cessna 170 outsold all other four-place airplanes, regardless of price.

Cessna 190 SERIES

CESSNA 190 SERIES ON DISPLAY AT YOUR CESSNA DEALER'S

A big, beautiful plane that's perfect for large or small business because it's so practical and economical. Air-line type engines and comfort. Over 160 m.p.h. cruising speed, Hamilton Standard Constant Speed Propellers.

MAIL THIS COUPON NOW!

Cessna Aircraft Co.
Dept. AW-4, Wichita, Kansas
Please send free literature giving complete description of the Cessna 170.

Name_____ Address_____

City_____ State_____

Firm Name_____ Phone No._____

DURANICKEL

A wrought, age-hardenable, corrosion-resisting alloy

Duranickel® is a wrought, non-ferrous, slightly magnetic alloy. It has the higher strength found only in the heat-treated alloy steels, and not offered by other corrosion-resisting alloys available at comparable cost levels.

The principal engineering characteristics of Duranickel are:

- **Mechanical Properties:** The accompanying table shows the ranges of Ultimate Tensile Strength, Yield Strength, Elongation, and Hardness values for various forms and conditions of Duranickel.

- **Shear Strength:** Values for the ratio of maximum shearing strength to ultimate tensile strength range from approximately 0.5 to 0.6 and are comparable to those of mild and low-alloy steels.

- **Endurance Limit:** In rotating beam tests of polished specimens at room temperature and 10,000 rpm for 10^8 cycles, Duranickel hot-rolled showed an endurance limit of 51,000 psi.; hot-rolled, age-hardened showed 52,500 psi.; cold-drawn 51,000 psi.; and cold-drawn, age-hardened showed 61,000 psi.

- **Impact Strength:** Charpy impact strength ranges from 240 ft. lb. for hot-rolled Duranickel and 190 ft. lb. for cold-drawn, to 40 ft. lb., for the age-hardened condition.

- **Spring Properties:** Duranickel wire can be cold-drawn and age-hardened subsequently to develop tensile strength of the order of 225,000 psi. The torsional proportional limit of cold-drawn and age-hardened wire is about 40 per cent of the ultimate tensile strength. Duranickel springs are used at temperatures up to 550°F.; the stresses used should be governed by existing service conditions.

- **Working Characteristics:** Duranickel may be hot-worked, forged, and cold-worked. It can be machined most readily in the annealed condition and is commercially machinable in other conditions at hardnesses up to 275 BHN. The use of a cutting lubricant is essential for all machining work because Duranickel, like all high-nickel alloys, is characteristically "sticky" and tends to gall or build up on the tools. Duranickel can be joined by the usual welding, brazing and soft soldering processes common to industry.

- **Variants:** For special uses there are two alloys similar to Duranickel. They are: (1) Duranickel "R" containing a higher percentage of carbon for use where applications require optimum machinability. (2) Permanickel® having the same mechanical properties as Duranickel but different physical constants, particularly better electrical and thermal conductivity and stronger magnetic properties. Permanickel is preferred for service as springs requiring high electrical conductivity; equipment requiring good thermal conductivity and magnetostrictive units where high fatigue strength is required. Special applications include thermostat tension springs, reaction springs, clips, grid wires and side rods in vacuum tubes.

- **Corrosion Resistance:** The corrosion resistance of Duranickel in all its forms is of the same order as that of nickel to a wide variety of media, including mineral and organic acids, alkalies, salts, potable and industrial waters, food products, organic compounds and oxidizing atmospheres at normal and elevated temperatures.

- **Forms Produced:** Duranickel is supplied in most commonly used mill forms—rods, hexagons, squares, rounds, flats, strip, sheet, wire and welding materials.

- **Applications:** Duranickel is used in many applications where corrosion resistance, high hardness, and great strength are required. In the production of plastics, Duranickel is a standard material for dies, injection cylinders and extrusion screws. Duranickel springs, from both wire and strip, give excellent service. Instrument parts include diaphragms, bellows, flapper valve discs, snap switch blades, and grid wires and side rods in vacuum tubes.

Mechanical Property Ranges of Duranickel

Form and Condition	Tensile Strength 1000 psi.	Yield Strength (0.2% offset) 1000 psi.	Elongation in 2 in. per cent	Hardness Rockwell C
Rod and Bar				
Hot-finished	90-130	35-90	55-30	75B-22
Hot-finished, age-hardened	160-200	115-150	30-15	32-42
Cold-drawn, as-drawn	110-150	60-130	35-15	90B-32
Cold-drawn, age-hardened	170-210	125-175	25-15	32-42
Strip				
½ hard	130-155	.....	15-3	25-34
½ hard, age-hardened	170-210	.....	20-7	33-42
Spring	155-190	.....	10-2	30-40
Spring, age-hardened	180-230	.....	15-5	36-46
Wire				
Spring	160-200	.....	5-2	....
Spring, age-hardened	200-240	.....	10-5	....

FURTHER DATA AVAILABLE

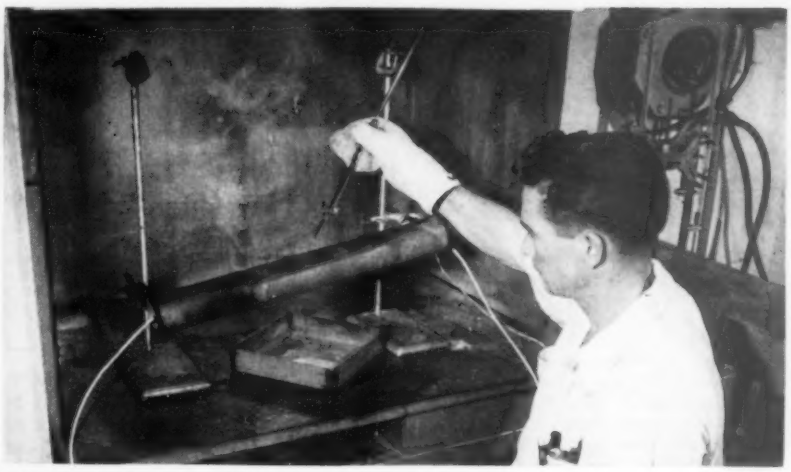
A 22-page reference manual, *Engineering Properties of Duranickel*, Technical Bulletin T-32, contains all essential engineering information. It is available, free, for your files. For help on specific metal problems, write directly to Inco's Technical Service, outlining your problems.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

Nickel Alloys

MONEL® • "R"® MONEL • "K"® MONEL • "KR"® MONEL
"S"® MONEL • INCONEL® • NICKEL • "L"® NICKEL
DURANICKEL® • PERMANICKEL®

REFERENCE FLUID BURNS when dribbled on hot pipe, but . . .



SKYDROL DOESN'T BURN when subjected to the same test.

All Big DC-6 Fleets Go to Skydrol

Douglas reports cases where the fire-resistant fluid has sprayed onto white-hot brakes without burning.

By George L. Christian

American Airlines will convert the cabin supercharger drives of its 50 DC-6s to Skydrol hydraulic fluid next month, bringing all major DC-6 operators into the Skydrol camp.

Skydrol, announced in 1948, is the first fire-resistant hydraulic fluid to receive popular acceptance among commercial airlines, both U. S. and foreign. And many carriers are specifying the fluid for use in the main hydraulic system of soon-to-be-delivered DC-6As and -Bs. Every DC-6B to be used in domestic service will use Skydrol, according to the manufacturer. Among other users are: Panagra, Pan American World Airways, Slick Airways, Philippine Air Lines and United Air Lines.

Developed jointly by the Douglas Aircraft and Monsanto Chemical Companies, Skydrol was first used exclusively in a commercial aircraft in Capital Airlines' Super DC-3s. More than 78 formulas and 28 fluids were tested before the most desirable compound was found.

▶ **Less Wear and Tear**—Of significant importance, other than its fire-resistant

Silicone

RUBBER PARTS

Only Silicone rubber parts retain their physical, chemical, and dielectric properties at temperatures ranging from −110° to +500° F. In addition, they feature excellent resistance to many chemicals, weathering, oxidation, moisture, ozone, and other factors that damage or destroy organic rubbers.

Today, Silicone parts are meeting the exacting demands of innumerable applications in the aviation, automotive, electrical, and other original equipment manufacturing industries.

Stalwart Rubber is equipped to produce a wide range of precision parts from Silicone rubber stocks to meet individual specifications.

Write today for Catalog S1SR-1 for complete information.

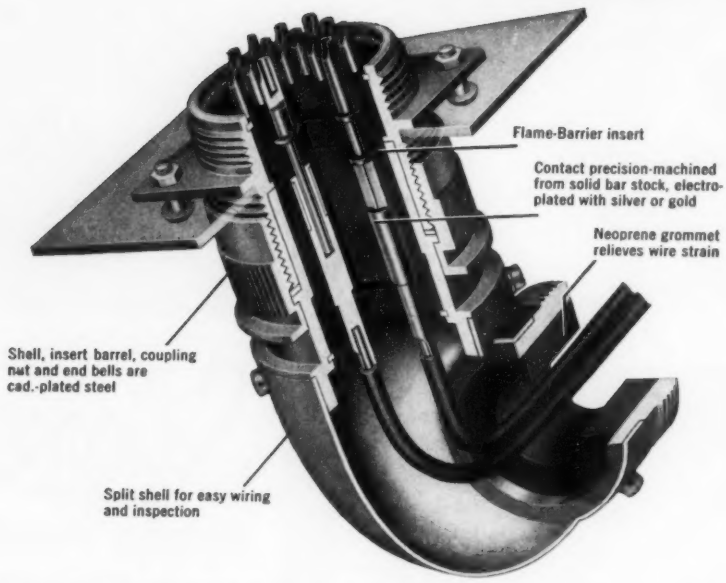
1251-SR

STALWART RUBBER COMPANY

6362 Northfield Rd. • Bedford, Ohio

Here's why those in the know

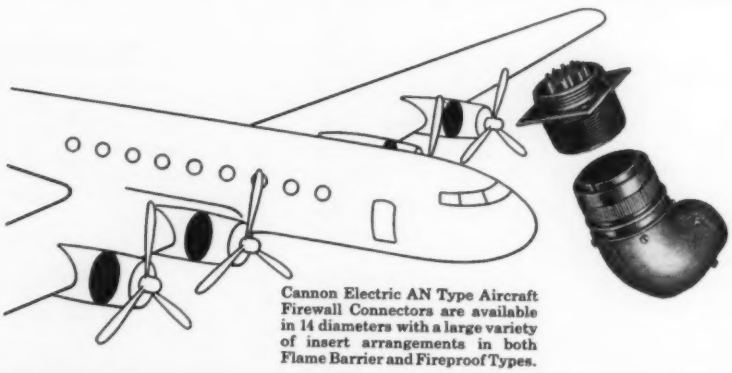
–demand **CANNON PLUGS**


Flame-Barrier insert
Contact precision-machined from solid bar stock, electro-plated with silver or gold
Neoprene grommet relieves wire strain
Shell, insert barrel, coupling nut and end bells are cad.-plated steel
Split shell for easy wiring and inspection

Here is another example of the care Cannon Electric takes in developing a connector for specialized use. This is the Firewall Connector to prevent the spread of a possible aircraft engine fire through the bulkhead into wing sections.

Illustration shows Flame Barrier type with phenolic insert and contacts having solder cups. Shell must resist an open flame of 2000° F for 20 minutes. Electric circuits not required to remain active.

The Fireproof continuous service type is similar in appearance, but has crimp-on type contacts in fireproof insert material. Must carry rated DC current under open flame of 2000° F for five minutes and withstand vibration of ¼" double amplitude at 2000 cycles per minute. Designed for aircraft, this connector has other applications where the going is tough. *For further information request Cannon Electric Firewall Bulletin.*



Cannon Electric AN Type Aircraft Firewall Connectors are available in 14 diameters with a large variety of insert arrangements in both Flame Barrier and Fireproof Types.

CANNON ELECTRIC

Since 1915

Los Angeles 31, California

REPRESENTATIVES IN PRINCIPAL CITIES

In Canada and British Empire: Cannon Electric Co., Ltd., Toronto 13, Ontario. World Export (Excepting British Empire): Frazar & Hansen, 301 Clay Street, San Francisco, California.

Skydrol Properties—Physical and Chemical

Appearance—Clear, transparent oily liquid.
Color—Light green.
Specific gravity @ 32F—1.0980.
@ 176F—1.0345.
@ 248F—1.0031.
Weight per gallon @ 32F—9.14 lb.
@ 248F—8.36 lb.
Acidity (Mg. KOH/Gm.)—0.18.
Boiling point @ 760 mm Hg.—709F (Calculated).
Flammability—Does not support combustion (Exceeds requirements of AMS-3150.)
Pour point—Minus 70F.
Autogenous ignition temperature—1050F.
Thermal conductivity—477 Btu/hr/ft²/ft/deg. F.
Viscosity
@ −40F—Less than 7,000 centistokes.
@ −30F—2,256 centistokes, 10,420 SSU.
@ 100F—15 centistokes, 77.2 SSU.
@ 210F—3.85 centistokes, 38.9 SSU.
Viscosity index—160.
Modulus of compressibility—328,000 psi.
Solubility—0.003% in water; 0.25% water in.

Miscellaneous Data

Shell Four Ball Wear Tests
(1 hour @ 167F. and 600 rpm.)
Steel on Steel —40-kg. load; scar dia., 0.54 mm
Steel on Bronze—40-kg. load; scar dia., 1.12 mm

Paints

Skydrol resistant paint is available from Arco Co. Los Angeles; Sherwin-Williams Co., Los Angeles.

Packings and Gaskets

A. "O" Rings
E. F. Houghton and Co., Type 10V70–111
Kirkhill Rubber, Type X-682
Linear, Inc., Type PR-70
Plastic & Rubber Products of Dayton, Dayton, Ohio, Type 903–70
Plastic & Rubber Products of Los Angeles, Los Angeles, Calif., Type TC-315a
Above to be used with standard Douglas back-up ring S-4244380 or equal.

B. Chevron Packings
E. F. Houghton and Co., Type 10V–85–94
Kirkhill Rubber, Type X-682
Linear, Inc., Type PS-85V
Plastic & Rubber Products of Los Angeles, Los Angeles, Calif., Type TC-315a
Above to be used with back-up chevron molded from du Pont nylon, compound FE-2015 or JM-6339B or elements impregnated with E. F. Houghton and Co compound #1243 if the system operates at 1500 PSI or less, and the operation is not too severe.

qualities, is Skydrol's greatly improved lubricity. Douglas reported at the recent Air Transport Assn.'s Engineering and Maintenance Conference at Chicago that, after 250,000 unit flight hours, the DC-6 cabin supercharger units have been operating very satisfactorily on Skydrol. Particularly, steel-to-bronze wear was considerably reduced. It indicated that replacement of Vickers pump rotating assemblies using Skydrol have been only 1/6 to 1/10 the number using other fluids (AVIATION WEEK May 7, p. 15).

That Skydrol does what it was intended to do was underlined by Douglas' statement that "there have been two instances in our flight test operations where hydraulic fittings have loosened during braking tests which have resulted in spraying Skydrol onto the white-hot surfaces of exposed discs. Brake fires have been avoided, since only momentary flashes were observed."

Autogenous ignition point of Skydroll is 1050F. This compares to 750F for the Aircraft Industries Assn. reference fluid HS-1 and about 500F for

Since 1938... PLEXIGLAS Has Kept Pace

PLEXIGLAS canopy, nose and windows on the Boeing B-47A. Canopy, nearly 8 feet long, is laminated; windows are PLEXIGLAS II.* Fabrication by Goodyear Aircraft Company.

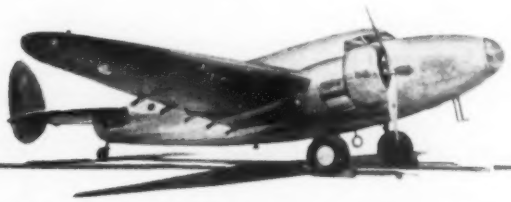
*Meets Army - Navy Material Specification MIL-P-5425.

From its use as a landing light cover on the nose of a globe-circling plane, to a position as *aviation's standard material* for transparent enclosures and windows—PLEXIGLAS has kept pace with the industry's rapid growth.

In 1938, when Howard Hughes took off on his flight around the world, PLEXIGLAS rode with him—shielding the landing light in the nose of his Lockheed 14. It was a dramatic use of a new material. Within less than two years, Rohm & Haas had developed methods of producing and forming *large* PLEXIGLAS sheets for airplane enclosures, and helped make possible the improved aerodynamics of the planes of 1940-50.

On *today's* planes, too, PLEXIGLAS is the standard transparent material. With good heat resistance and stress-solvent craze resistance, PLEXIGLAS II—meets rigorous Army-Navy specifications for current high-speed, high-altitude aircraft. And the present trend toward *laminated* enclosures on combat planes is possible because of the adaptability of PLEXIGLAS to the necessary laminating and fabricating techniques.

For the planes of the *future*, Rohm & Haas laboratories are working to raise the standards of transparent plastics to even higher levels. Our technicians and service staff stand ready to help in any problem involving aviation applications of PLEXIGLAS. Our Design and Fabrication manual should be in your hands. Send for it.



PLEXIGLAS landing light cover on nose of Howard Hughes' globe-girdling Lockheed 14. Hughes' record-breaking flight broadened dramatically the field of aircraft design and performance.

PLEXIGLAS *is a trade-mark, Reg. U. S. Pat. Off. and in principal foreign countries.*

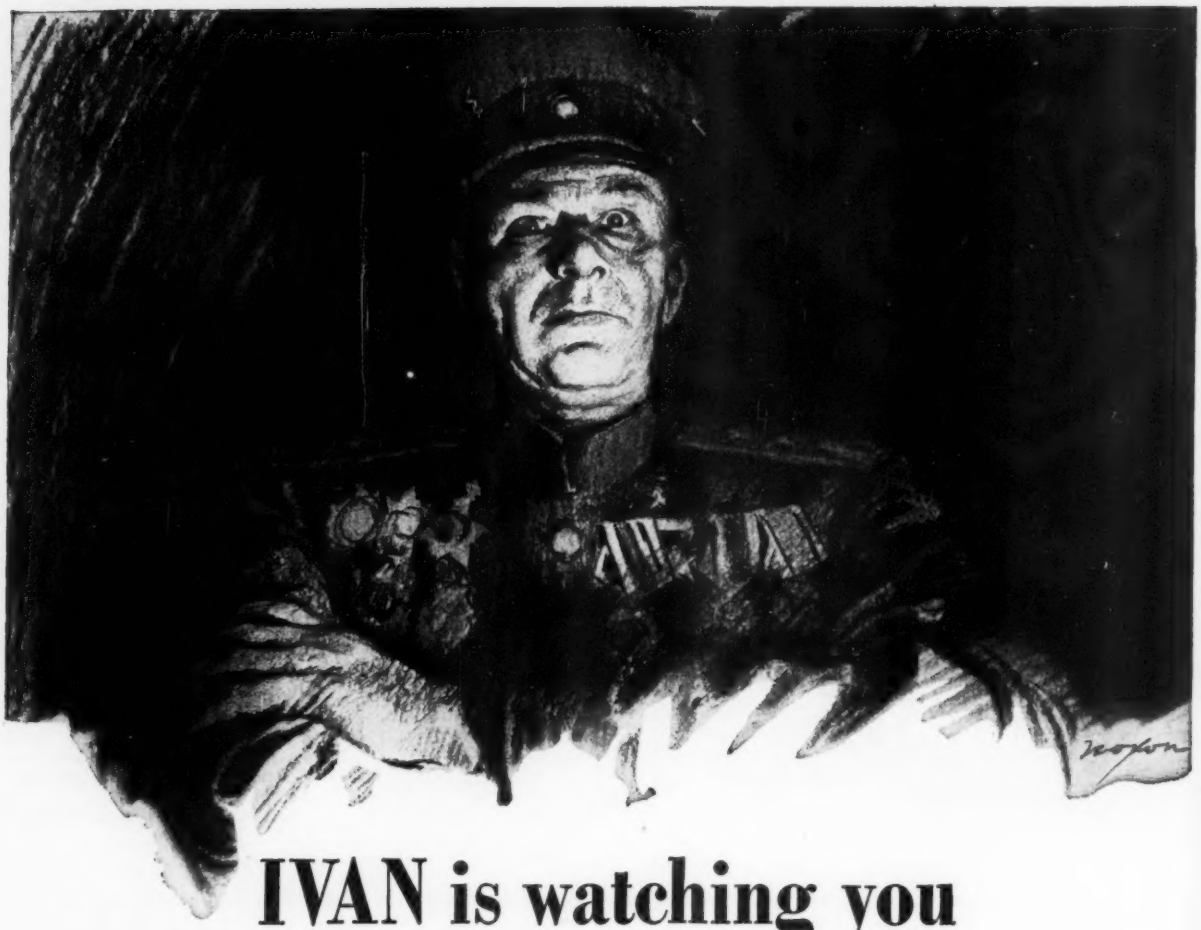
Canadian Distributor: Crystal Glass & Plastics, Ltd., 54 Duke Street, Toronto, Ontario, Canada.

CHEMICALS FOR INDUSTRY

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Representatives in principal foreign countries



IVAN is watching you

IVAN is a dyed-in-the-wool Communist. There are only 6 million party members like him in all Russia, yet these Communist brass-hats enforce the iron dictatorship of the Kremlin over *200 million* Russians.

He's sold to the hilt on Red ideas. Which means he's out to get *you*. He believes it's either you or him . . . that the world is too small for both.

Ivan is working hard to beat you down. He has a big head start.

Right now he's got you in a bad spot.

Ivan is afraid of only one thing.

He fears your ability to out-produce him in guns, tanks, planes.

Frankly, he doesn't think you value your free system enough to do it . . . to make willingly the sacrifices he has squeezed out of the Russians.

But he's wrong!

Because you and all of us have set out to build more and better weapons—to do it faster all the time.

We must use every bit of know-how and inventive skill we have to improve our machines and methods—to turn out more and more for every hour we work. Only in this way can we become militarily strong.

But we've got to supply essential civilian needs as well. We can't allow needless shortages to take prices skyrocketing and lower the value of our dollar.

Sure, that means sacrifices for everybody. But doing this double job well is the only sure way to stop Ivan in his tracks—and to save the freedoms which are ours and which he has never known.

FREE . . . this important booklet tells you how our American System Grew Great

How Americans developed better machines, power and skills to build a great nation . . . Why we have been able to produce constantly more per hour . . . How this has given us the world's highest living standard.

How we can meet today's challenge—Why we must expand our productive capacity . . . supply arms and essential civilian needs, too. Read how this dynamic process works in free booklet, "The Miracle of America," endorsed by representatives of management and labor. Send for your free copy today!

MAIL THE COUPON—
The Advertising Council, Inc., 25 West 45th St., Dept. B. P. New York 19, N. Y.

Name_____

Address_____

Occupation_____

This advertisement, approved by representatives of management, labor and the public, is published in the national interest

McGRAW-HILL PUBLISHING COMPANY

A PUBLIC SERVICE PROJECT OF THE ADVERTISING COUNCIL

THE BETTER WE PRODUCE
THE STRONGER WE GROW

petroleum hydrocarbon fluids, says Monsanto. It adds that in a simulated hot manifold test, during which a stainless steel pipe is heated to 1300F, the reference fluid burned upon contact with the pipe but extinguished itself when running off into the drip pan. In the manifold test, Skydrol does not burn on the pipe. And in the low pressure spray test, consisting of spraying fluid on a burning rag saturated with 120 grade standard aircraft engine oil, Skydrol does not increase the intensity of the fire.

Other advantages cited by the manufacturer are:

• **Small viscosity changes** over wide ranges of temperature and satisfactory operation to −40 deg.

• **High shear strength.** During tests, Skydrol operated the equivalent of 4,000 flight hours under maximum pressure at a temperature of 160 deg. with viscosity loss due to shear breakdown of less than 18 percent. As a comparison, Monsanto says that "presently used fluids undergo 30 percent breakdowns in about 2,000 flight hours." Its excellent stability under high shear stress is indicated by the fluid operating satisfactorily at pressures exceeding 5,000 psi. with negligible loss of film strength.

• **Skydrol is heat stable** and oxidation resistant. There is no appreciable volume loss or viscosity change due to evaporation.

• **Virtually inert chemically,** the fluid will not attack aluminum, magnesium, aircraft bearing alloys, copper, steel or other structural metals.

• **Skydrol contains no halogenated** hydrocarbons, salts nor water. It is a chemically stable ester base compound and does not deteriorate in service.

▶ **Precautions**—Precautions to be taken with Skydrol are replacement of all packings or gaskets of natural rubber, synthetic rubber or Neoprene if volume changes are not objectionable. Since the fluid has a tendency to soften most insulations used on electrical wiring, care should be taken to keep leaking fluid away from electrical cables. Nylon-type insulation resists Skydrol. Similarly, although ordinary paints are removed by the fluid, nylon paint is unaffected.

Skydrol is not toxic, gives off no dangerous fumes and does not attack the skin. No special precautions are required for handling or storing the fluid.

To date airlines flying Skydrol-equipped planes have expressed satisfaction with the fluid. The only consistent complaints have been due to premature chewing of "O" ring packing, resulting in leakage and paint removal.

Douglas says that the "O" ring chewing problem "appears to have been traced to those installations where mechanical reversals or surges have been

T-J SETS RIVETS and CLINCH NUTS Faster!

T-J CLINCHOR ... shown here is one of six special 8" throat Underfeed Clinchors used by a large automotive body manufacturer. These Clinchors feed and set 11/16" square cased nuts in outside quarter panels, left and right hand.

TWIN RIVITOR used for riveting flat steel springs to mounting brackets for automobile horns.

•

T-J RIVITOR used for automotive clutch plate assembly. Saves time and labor doing a four-fold job—assembling, setting, inspecting and ejecting.

Set clinch nuts 3 to 5 times faster with a T-J Clinchor! Fully automatic ... controlled by a single foot pedal. Available in Underfeed and Gravity feed models, throat depths 8" to 36".

For *high production* ... T-J Rivitors! Automatically feed and set solid rivets. Set 1/16" to 1/4" diam. solid steel rivets up to 7/8" long using *electrically powered* Rivitor ... aluminum alloy rivets up to 1/4" diam. or steel rivets up to 1/8" diam. and up to 3/4" long, using *air powered* Rivitor. Throat depths, 8" to 36".

Speed up assembly in aircraft, farm machinery, automotive, stampings of all kinds ... with T-J dependability! Write for Clinchor bulletin 847; Rivitor bulletins 646 and 847. The Tomkins-Johnson Company, Jackson, Michigan.

35 Years Experience

T-J TOMKINS-JOHNSON

RIVITORS · AIR AND HYDRAULIC CYLINDERS · CUTTERS · CLINCHORS

CONNECTORS
by AMPHENOL
AMPHENOL has always been the leader in the development and perfection of electrical connectors for power, signal and control circuits in aircraft and electronic equipment. Specify AMPHENOL — the quality name in electronics.
• A-N CONNECTORS
• SUBMERSION-PROOF CONNECTORS
• HEAVY DUTY POWER PLUGS
• AUDIO CONNECTORS
• 100 CONTACT CONNECTORS
• QUICK DISCONNECT CONNECTORS
• CABLE CONNECTORS
• POWER PLUGS
• RACK AND PANEL CONNECTORS
• MINIATURE CONNECTORS
• SEALED RELAY PLUGS
• RF CONNECTORS
• HEAVY DUTY RADIO CONNECTORS
AMPHENOL
AMERICAN PHENOLIC CORPORATION
1830 SOUTH 54TH AVENUE, CHICAGO 50, ILLINOIS

present in addition to steady hydraulic pressure. Such installations are the landing gear oleos and wing flap retract cylinders. These problems have apparently been solved, at least to date, through the use of a spiral-type Teflon back-up ring in place of the original leather back-up ring behind the 'O' ring. Packing performance in other parts of the airplane has apparently been satisfactory." And since nylon paint solves the paint removal problem, the manufacturer hopes that the last "bugs" have been deleted from Skydrol hydraulic fluid.

New Double Seat

Transport Equipment Co. has started deliveries of 820 double passenger seats to the Glenn L. Martin Co. for installation in TWA's 4-0-4 fleet.

Custom-designed for TWA, the Burbank firm got out the final production version in 90 days from date of order.

TECO points to these features:

- All-steel, chrome-molybdenum tubular structure to meet TWA's 9G requirements.
- Windlass-type, lever-operated reclining mechanism.
- Washable plastic covering.
- Foam-rubber cushions throughout.
- Adjustable foot rests and "posture correct" seat design.

High-Altitude Brush

Brushes for aircraft motors and generators, specially engineered to provide a high standard of performance at high altitude, have been developed by the Pure Carbon Co., Inc., St. Marys, Pa.

The new development, as the company explains it, "embodies a combination of chemically treated and untreated brushes . . . which are combined in such a way to put just the right amount of film on the commutator or ring to give good operation at high altitude."

Ordinarily, the brush is made up of an impregnated section, sandwiched between two layers of untreated material. By varying the thickness of the treated

CROUSE-HINDS Type HSL

... the *economical* and *flexible* high intensity airport runway light

Crouse-Hinds TYPE HSL is approved under Specification L-820 "Fixed Focus Uni-Directional High Intensity Runway Light." This system features both economy and flexibility. It is economical because only one of the 95-watt main beams is turned on in bad weather, and only a 30-watt light in clear weather. It is flexible since the high intensity beams can be individually adjusted for the most effective angle of toe-in and elevation for any particular airport and any season of the year. This adjustable toe-in produces the best visibility for differing atmospheric conditions. This fixture provides a main beam in only one direction, without the background haze resulting from the "back beam." After relamping, the sealed beam optical system is back to 100% initial efficiency.

Crouse-Hinds offers all three types of high intensity runway lights. Each of the other two types have their individual advantages.

Type HRC is a controllable beam bi-directional high intensity runway light. It utilizes a double prismatic lens system on a cast aluminum base, with a 500-watt, 115-volt lamp mounted on a movable socket. The main beams may be "toed in" or "toed out" by remote control from the tower to provide the best setting for particular visibility conditions. The candlepower is the highest of the three types.

Type HRL is a fixed focus bi-directional high intensity runway light. It uses a 200-watt lamp and is provided with a series to series insulating transformer installed underground in the base housing. This system has the lowest installation cost, and for many airports its use is justified for non-instrument runways, as well as instrument runways.

All three fixtures provide the required basic high intensity candlepower and all use a 5-stage brightness control. They are designed for easy maintenance and have heat-resisting glassware, breakable couplings, disconnecting cable connectors, and standard steel transformer housings. They are carefully built to Crouse-Hinds high standard of quality from the finest material.

A Nationwide Distribution Through Electrical Wholesalers

CROUSE-HINDS COMPANY
Syracuse 1, N. Y.

Offices: Birmingham — Boston — Buffalo — Chicago — Cincinnati — Cleveland — Dallas — Denver — Detroit Houston — Indianapolis — Kansas City — Los Angeles — Milwaukee — Minneapolis — New York Philadelphia — Pittsburgh — Portland, Ore. — San Francisco — Seattle — St. Louis — Washington. Resident Representatives: Albany — Atlanta — Baltimore — Charlotte — New Orleans — Richmond, Va. CROUSE-HINDS COMPANY OF CANADA, LTD., TORONTO, ONT.

AIRPORT LIGHTING · FLOODLIGHTS · CONDULETS · TRAFFIC SIGNALS

section, amount of film deposited by the brush can be controlled. According to the developer, a practical method of securely cementing brush layers has been devised.

For most applications where the brush must operate from sea level to altitudes of 50,000 ft., the company has found that a brush consisting of one part treated and an equal part untreated material gives good results. In other cases, depending on load and other variables, a treated section about one-third the total thickness of the brush has been indicated.

Other brush arrangements are suggested, particularly where equal layers of treated and untreated material have been found satisfactory. For example, on brushes ⅜-in. or thicker a split-brush construction could be used, the firm says. On smaller brushes where there are two or more brushes operated in tandem, a combination of one treated and one untreated brush can be used, it explains. An advantage of this latter construction (where it can be used) is that it would reduce costs, since price of impregnated brushes is "considerably greater" than untreated types.

The company stresses that with its process, almost an exact amount of chemical impregnation is contained in each brush. It asserts control by its method is much closer than by other methods commonly used.

FIRSTS

BY BELL AIRCRAFT

FIRST Supersonic Aircraft (X-1)

FIRST Jet-Propelled Fighter in U. S. (F-59)

FIRST Commercially Licensed Helicopter

BELL AIRCRAFT CORPORATION

NEEDS

SCIENTISTS! ENGINEERS! DESIGNERS! DRAFTSMEN!

to accept the challenge of development work in...

LONG RANGE PROGRAMS

on

GUIDED MISSILES

AIR-BORNE ELECTRONIC EQUIP'T

ROCKET ENGINES

HELICOPTERS

CONVERTIPLANES

Scientific or engineering degree and extensive technical experience required.

INQUIRE NOW!

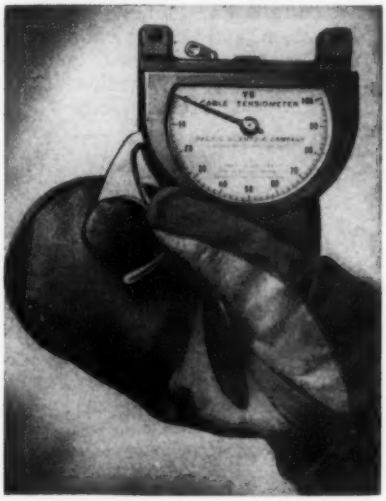
Manager, Engineering Personnel

BELL Aircraft CORPORATION

P.O. BOX 1 BUFFALO 5, N. Y.

SERVING THE AIRCRAFT INDUSTRY FOR OVER 30 YEARS
Aircraft Tubing
SERVICE STEEL CO.
AIRCRAFT TUBING
For over thirty years Service Steel Co. has kept pace with the aircraft industry, supplying the latest in quality steel tubing.

NEW AVIATION PRODUCTS



Arctic Cable Tester

During winter weather or in the Arctic, a mechanic working outdoors often has to decide whether it's best to do a certain job with limber fingers in cumbersome mittens, or stiff fingers without mittens.

A tool which makes the decision for him is a new "mitten-grip" tensiometer specially built for comfortable, efficient hand operation with heavy mittens, like those used by Air Force mechanics.

The tool is designed for accurate cold weather testing of aircraft control cables and was developed by Pacific Scientific Co. According to the firm, there is no temperature error with this device, hot or cold, and the dial pointer does not have to reset at zero.

In locations where it is difficult to see the face of the dial during tests, a lock can be operated to "freeze" tension readings so they can be checked after unit has been removed from cable.

The tensiometer is available in models for testing secondary control cables from zero to 100-lb. tension and for primary cables up to 2,000-lb. tension. No damage to the instrument can result from over-range use, says the maker. Address: 143 Grande Vista Ave., Los Angeles 23.

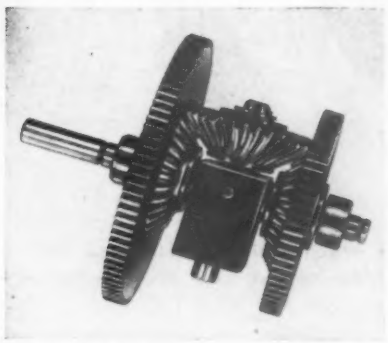
Lighter 'Speed Nuts'

New flat-type "Speed Nuts" for aircraft are lighter in weight, will save you as many as three manhours for every 1,000 fastenings made, and are less apt to score adjacent surfaces when they are applied.

These points are underscored by Tinnerman Products, Inc., which produces them. The self-locking nuts are interchangeable with types conforming to Specification AN 364 and AN 365 on screw-driven non-structural applications.

Only fingertip pressure (no tools) is required to hold them in position while screws are being driven. To prevent scoring of aluminum surfaces, ends of the flat nuts are turned up. In fastening seal strips, they provide greater bearing surface.

Nuts are listed in NAS 446 standards for 4, 6, 8 and 10B(Z) tapping screws. The 10B type takes an AN 530 screw with a tapered lead and coarse threads for quicker starting and faster driving. Tinnerman's address is Box 6688, Dept. 14, Cleveland 1.



New Differential

A mechanical differential employing a single spider gear—instead of two gears normally used—has been developed by Ford Instrument Co.

The unit is designed to meet high performance requirements of special close-control instrumentation and analog computers. It has "far less" friction and is more accurate than any mechanical differential previously developed, according to Ford.

The spider gear is a new type, designed to combine the best features of spiral gears with those of straight tooth gears. It provides the smooth motion of spiral gears with the feature of equal friction in either direction afforded by straight-tooth gears. This is made possible through use of special curved-tooth bevel gears cut to a zero degree spiral angle.

Special precautions are taken during assembly to keep backlash at a minimum, and further improvement in accuracy is attained by using the largest pitch-diameter gears compatible with the minimum overall dimensions of the differential, Ford explains. Lost motion in the shaft is guaranteed not to exceed 5 min. of arc on the ¼-in. and 5/16-in. models, and 7-min. on the 3/16-in unit.

An advantage cited by Ford is that

DARNELL

• Save Money, Floors, Equipment and Time by using DARNELL Casters and Wheels . . . Always dependable, these low-cost floor protection products have been made to give you a long life of efficient, trouble-free service.

A SAVING AT EVERY TURN

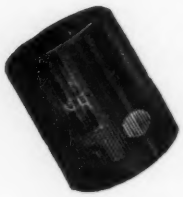
DARNELL CORP. LTD.
LONG BEACH 4, CALIFORNIA
60 WALKER ST., NEW YORK 13, N.Y.
36 N. CLINTON, CHICAGO 6, ILL.

SPS AIRCRAFT FASTENERS

UNBRAKO

NAS INTERNAL WRENCHING AIRCRAFT BOLTS

CLOSE-TOLERANCE, HIGH-STRENGTH SHEAR BOLTS—made to latest NAS Specifications. Threads are fully formed by rolling after heat treatment, an important UNBRAKO feature. Full range of standard sizes.



NAS INTERNAL WRENCHING SELF-LOCKING NUTS

. . . meet all requirements of latest NAS Specifications Superior safety nuts. Sizes from ¼" to 1½".

FLEXLOC

EXTERNAL WRENCHING NUTS

. . . incorporate the famous FLEXLOC self-locking principle and one-piece, all-metal construction. The exceptional reliability of this construction has been proved by the millions of FLEXLOCS used in the aircraft industry.

Other outstanding advantages include:

Maximum tensile with minimum weight

Approved under latest NAS Specifications

Large bearing surface

Positive self-locking—"won't shake loose"

Temperature range to +550° F.

No special tools needed—use standard 12-point socket or box wrenches. Designed for use in cramped quarters

Sizes from ¼" to 1½" NF Thread Series

Send for samples and information.

ONE-PIECE SELF-LOCKING NUTS

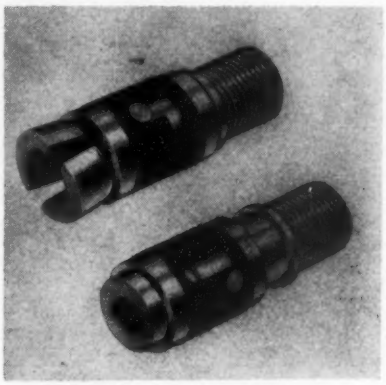
The one-piece FLEXLOC is both a stop and a lock nut, due to its resilient segments which lock *positively*, even under extreme vibration. Torque is unusually uniform—within a few inch pounds. "Thin" and "regular" types; NC and NF threads. Officially approved by many U. S. depts., bureaus, etc., and CAA for aircraft use.

Write for further information on these* UNBRAKO *and* FLEXLOC *Products.

SPS STANDARD PRESSED STEEL CO.

JENKINTOWN 3, PENNSYLVANIA

the new differential is interchangeable with older (two-gear) types. The unit is designed for extreme sensitivity as well as high accuracy, the company states. Breakaway torque is as low as 1/100 oz.-in. and static friction under load is less than five percent. Address: Ford Instrument Co., division of the Sperry Corp., Long Island City, N. Y.



Tie-Down Fitting

A quick-locking tie-down fitting, designed to meet seat loading requirements of the latest AN specifications covering this equipment, has been developed by Adams-Rite Mfg. Co.

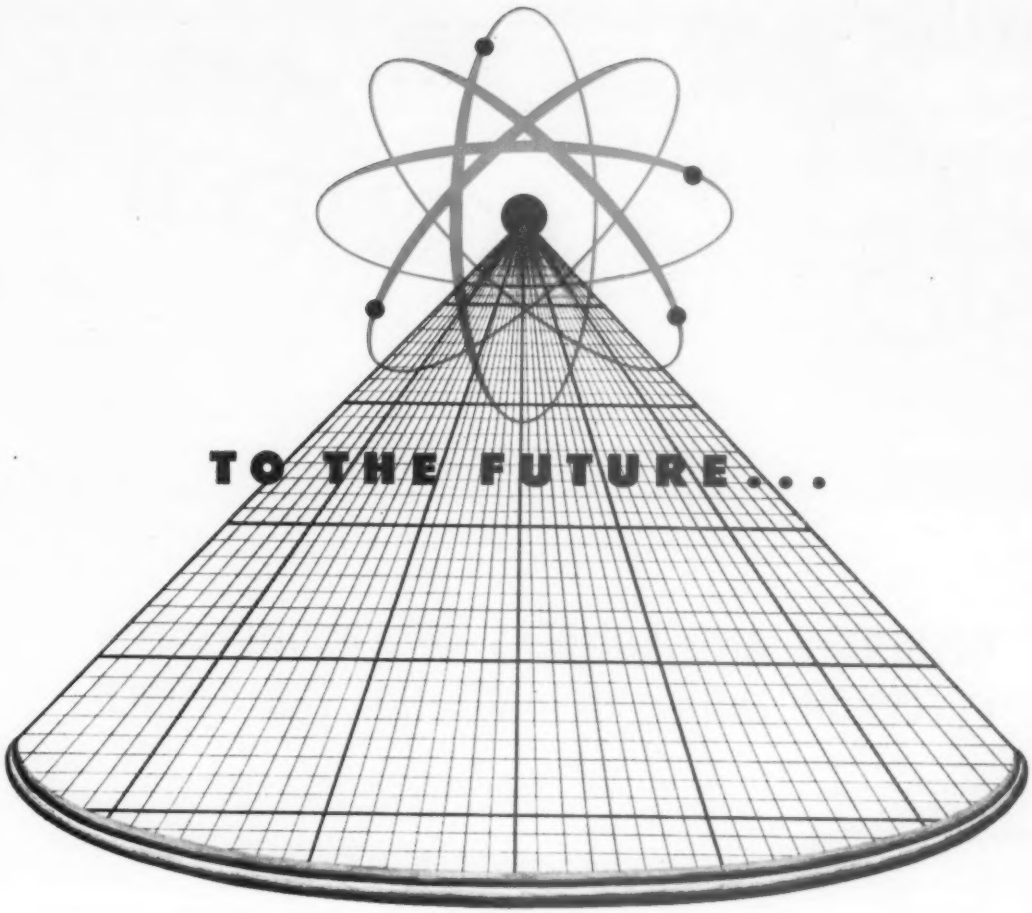
The fitting was developed in cooperation with West Coast airplane manufacturers, reports the company. It fits the stud in the standard AN7516 fitting.

As can be seen in the picture above, the device has a pair of jaws which can be instantly clamped together by means of a collar to lock the chair or litter to the floor. To release the jaws, the collar is turned to unlock it and then slipped downward away from the jaws. Address: 540 Chevy Chase Dr., Glendale 4, Calif.

ALSO ON THE MARKET

"Bomb-Tail" terminals for electrical wiring are closed-end type that can be installed with one stroke of tool. Said to have superior strength and insulating qualities, connectors can be used on solid or stranded wires ranging from No. 22 to 10 gage. Available from Aircraft-Marine Products, Inc., 2100 Paxton St., Harrisburg, Pa.

"Stamp-Ink" can be used for identification marking of incoming parts or temporary marking of production-line parts as they are moved from one operation to another. It is non-corrosive, non-etching and has good adherence to all metals, in addition to being resistant to petroleum-type cleaning fluids, oils and chlorinated solvents, says supplier, Organic Products Co., Irving, Tex.



ELECTRONIC RESEARCH AND DEVELOPMENT

● Long before the present rearmament program, our Electronics Division was engaged in research, development, and production for the United States and foreign governments. Air Associates is established as a major supplier of: LF, VHF and UHF communication and navigation systems, landing systems, firing-error indicator systems, echo-ranging systems (including sonar), *and* special miniaturized electronic devices. Whether your requirements are immediate or for the future, our diversified experience can help in solving airborne, marine and ground electronic problems. Your inquiry to Teterboro will receive prompt reply.

Air Associates
INCORPORATED
TETERBORO, NEW JERSEY

SERVING THE NATION IN AVIATION

DESIGNERS AND BUILDERS OF PRODUCTS FOR PRECISION INDUSTRIES 'ROUND THE WORLD

AUTOMATIC PILOT AND FLIGHT PATH CONTROL EQUIPMENT

AIRPLANE AND ENGINE INSTRUMENTS

AUTOSYN* AND MAGNESYN* REMOTE INDICATING SYSTEMS FOR:

- Fuel Flow
- Fuel Pressure
- Hydraulic Pressure
- Liquid Level
- Manifold Pressure
- Oil Pressure
- Position
- Temperature
- Torque Pressure
- Water Pressure

Fuel Flow Totalizing Systems
Manifold Pressure Gauges
Electric Tachometer Systems
Warning Units

FLIGHT AND NAVIGATION INSTRUMENTS

Accelerometers
Airspeed Indicators
Attitude Horizon Indicators
Dual Radio and Magnetic Compass Indicators
Gyro Flux Gate* Compasses
Magnetic Compasses
Rate of Climb Indicators
Turn and Bank Indicators
ODR Components

POWER SUPPLY EQUIPMENT

Alternators
Control Panels
Fault Protection Systems
Generators
Inverters
Line Relays
Overvoltage Protectors
Reverse Current Cutouts
Voltage Booster Dynamotors
Voltage Regulators
Power Failure Indicators

AIR PRESSURIZATION AND ICE ELIMINATION EQUIPMENT

Electronic and Mechanical De-Icer System Timers
Oil Separators
Pumps
Valves
Pressurization and Control Units

ENGINE STARTING EQUIPMENT

Booster Coils
Induction Vibrators
Relay Switches
Starters

ENGINE CONTROLS

Automatic Engine Power Controls
Automatic Engine Boost Controls

MISCELLANEOUS

Actuators—Linear and Rotary
Differential Pressure Switches
Oxygen Regulators
Gear Boxes
Flexible Drive Shafts
Turbine Power Supplies

SPECIAL PURPOSE ELECTRON TUBES

Amplifier Tubes
Counter Tubes
Gas-Filled Control Tubes
Klystron Tubes
Rectifier Tubes
Spark Gaps
Temperature Tubes
Voltage Regulator Tubes

PRECISION COMPONENTS FOR SERVOMECHANISM AND COMPUTING EQUIPMENT

Autosyn Synchros (Transmitters, Receivers, Differentials, Control Transformers, and Resolvers)
Amplifiers
Low Inertia Motors
Servo Motors and Systems
Transformers
Gyros
Rate Generators
Stabilization Equipment
Remote Controls and Indicating Systems

FOUNDRY PRODUCTS

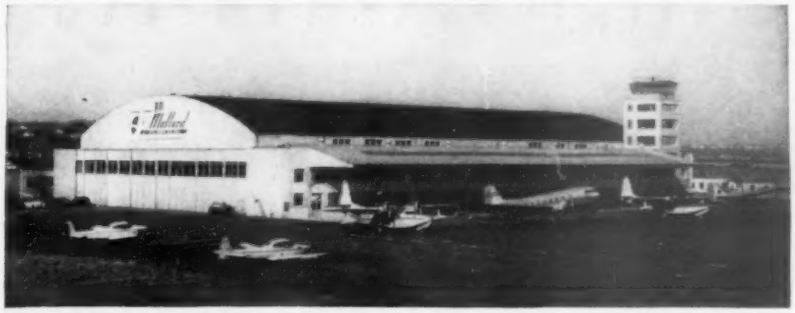
Sand, Permanent Mold, and Die Castings of Magnesium and Aluminum, for a wide variety of Aircraft and Industrial Applications. Non-Ferrous Precision Plaster Mold Castings.

*REGISTERED TRADEMARK OF BENDIX AVIATION CORPORATION

ECLIPSE-PIONEER DIVISION OF Bendix AVIATION CORPORATION

TETERBORO, NEW JERSEY

Export Sales: Bendix International Division, 72 Fifth Avenue, New York 11, New York



MALLARD AIR SERVICE'S successful executive plane service business led to big new . . .

MALLARD INDUSTRIES corporation plane conversion base, each feeding the other.

Hewitt Enters Conversion Business

Teterboro plane distributor sets up big Connecticut facility and plans expanding industrial activity.

By Erwin J. Bulban

The corporation executive plane conversion business—assuming rapidly increasing stature in the aviation sales and service picture, with added impetus given it by this country's expanding defense program—has lured an active East Coast private plane distributor into opening one of the largest and most ambitious conversion bases in the U. S. at Chance Vought's former airport, Stratford, Conn.

The new facility, headed up by young Bob Hewitt, president of Mallard Air Service, Inc., Teterboro Airport, N. J., is a separate corporate entity. Using its strategic location it promises to expand rapidly into a multi-function industrial effort in a relatively short time.

▶**Manifold Future**—Immediate operations engaging the new Mallard Industries' Connecticut base are:

• **Sale and conversion** of large corporation transport planes.

• **Hangarage and service** of the aircraft after they have been sold, maintaining them on a round-the-clock readiness.

Now being negotiated are:

• **Maintenance** and modification of airline planes.

• **Subcontracting** of airframe components for military producers.

To handle these ventures, Hewitt signed a lease with options with the City of Bridgeport Jan. 1. He will occupy four modern brick and steel hangars, with shops and offices, totaling nearly 132,000 sq. ft. under roof, plus immediate adjoining exterior areas. The spacious buildings, across the road from the former Vought production plant, where Avco is working on Wright R-1820 Cyclones, were used by the planemaker during the last war for production flight testing.

On Jan. 3 Mallard Industries moved in. Work started on the 7th. Even at this early date, the conversion backlog on planes of the DC-3 class runs well into September, on a two-shift basis. Present output is a DC-3 every 30 days.

For Dependable Hose Connections

WITTEK
STAINLESS STEEL
Aviation
HOSE CLAMPS

For over a quarter century, Wittek has specialized in hose clamps, devoting craftsmen's skills to producing hose clamps of uniform accuracy in clamping action combined with superior physical strength, for dependable leakproof hose connections. This experience is yours when you place your aircraft hose clamp requirements with us.

WITTEK FBSS
(Radial Type)
Made of stainless steel and utilizing the Wittek Floating Bridge. Tested and proved for dependable service on all types of aircraft applications. Long accepted as the standard of the industry.

WITTEK WWD
(Tangential Type)
Made of stainless steel and available in all standard aircraft sizes. Also furnished in diameters up to 12" for duct and other special applications. Permits easy installation when hose is in place.

Meet current AN specifications and have C.A.A. approval.

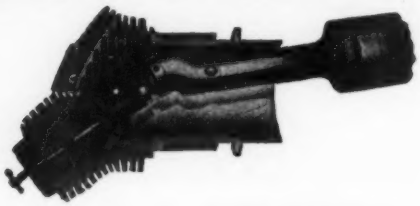
Write for Details

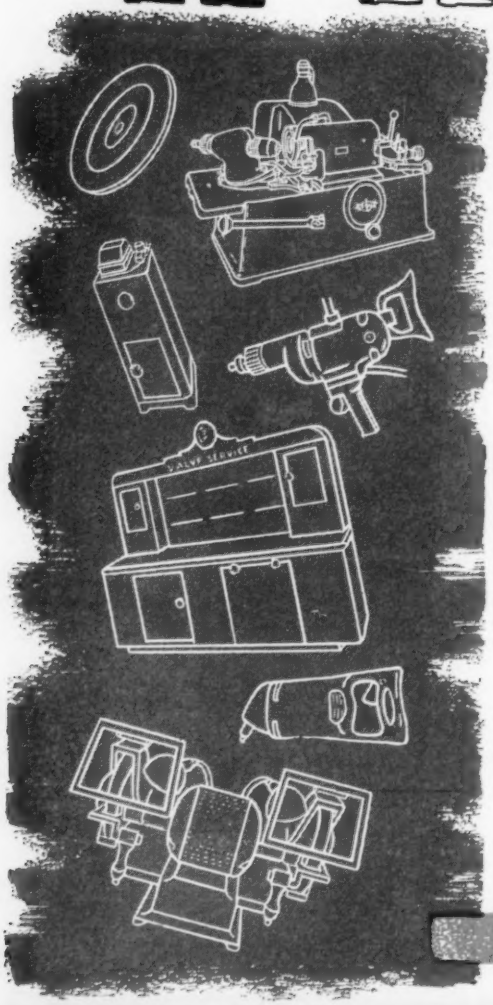
WITTEK Aviation HOSE CLAMPS

MANUFACTURING CO.
4308 West 24th Place, Chicago 23, Illinois

STRETCH MANPOWER!

Get *MORE PRODUCTION* from *EVERY MAN* with SIOUX TOOLS





SIOUX PERFECTED DUAL ACTION Aircraft Valve Seat Grinder

This highly developed, tested and proved grinder offers the modern, handy, time-saving method of refacing aircraft motor valve seats with accuracy . . . either cast, hardened steel, bronze or Stellite. The driving spindle is adjustable to any angle. Universal motor operates on AC or DC. Net weight 8½ lbs.

For that extra capacity you need so much NOW — you need tools that increase the efficiency and productive capacity of your men . . . So go SIOUX all the way.

Sold only through authorized SIOUX Distributors

STANDARD THE WORLD OVER

ALBERTSON & CO., INC. SIOUX CITY, IOWA, U. S. A.

Other work, such as modification and overhaul, extends the work-load to the end of the year at least. This is not saturation; schedules can be readily adjusted to handle a greater volume.

▶ **Genesis**—The reason for Mallard Industries is to be found in a long-time desire of Hewitt's to relinquish merchandising as his main activity and gradually to phase into becoming an industrialist.

The earliest indication of Hewitt's thinking, and probably the key factor leading up to his new activity, was when he leased a $1 million hangar from Port of New York Authority at Teterboro late in 1949 and opened a round-the-clock, all-week executive plane center catering to corporation aircraft and their users (AVIATION WEEK Dec. 5, 1949).

Here at Teterboro, where ". . . . more executive planes pass through than any other place in the country," Hewitt accumulated his corporation aircraft know-how. He had a photographic record made of the cabin of every plush transient plane and built up an extensive file of these interiors, which showed tastes in furnishings and the techniques in making them up. And in the course of building up this library, he also made numerous contacts with future clients.

▶ **Market Studied**—When Hewitt probed the market potential for an East Coast conversion base, the figures looked bracing. He found that about 70 percent of the U. S. industrial complex was located between Chicago and Boston, with one-third of the 1,000 major businesses having New York offices. Of the other two-thirds, 40-50 percent had offices between New York and Chicago.

The outbreak of hostilities in Korea and soaring airline business increased corporation apprehensions about a shortage of transportation between defense plants and Washington. This boomed the executive plane field. The U. S. business fleet of about 3,000 twin-engine craft has been growing at the rate of about 20 planes monthly—pouring approximately $1.5 million of business monthly into conversion centers.

Other factors made the field seem very lucrative:

• **Military airframe** subcontracting could be obtained that would fit well in with the necessary space and fabrication skills needed to rework large transports. Hewitt now is finalizing the necessary lists of production tooling needed and expects to have the equipment on hand in 90-120 days. His men are now lining up subcontracts.

The labor supply at Stratford is excellent, many former Chance Vought Aircraft employes having remained behind when the planemaker moved to Texas. The neighborhood has numerous fine shops for farming work out such as

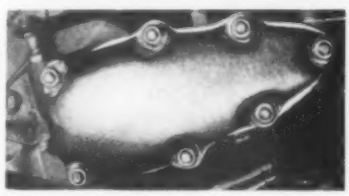
materials in the CONVAIR B-36 must withstand temperatures from −100° to +500° F.

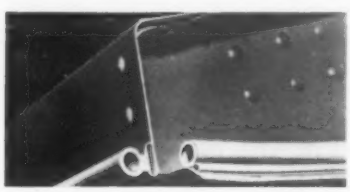
that's why SILASTIC*

is used wherever rubberlike properties are required at temperatures far above and below the limits of any organic rubber.

Silastic boots are used to increase the reliability and to prevent corrosion and untimely shorting of the limit control switches made by Exhibit Supply Company. They retain their strength and flexibility at temperatures of −100° F.

Silastic gaskets reinforced with glass cloth are used to seal the rocker arm housings in Pratt and Whitney "Wasp Major" engines. They withstand hot oil at operating temperatures in the range of 450° F.





Silastic is used to seal bomb bay doors and the cover plates, doors and windows in camera bays, where flexibility and resilience are required at temperatures ranging from −100° to +160° F.

Silastic gaskets reinforced with glass cloth are used to seal the cabin heating and pressurizing systems at operating temperatures in the range of −70° to 400° F.

For more data on Silastic phone our nearest branch office or write for New Silastic Facts data sheet D-5.

*T. M. REG. U. S. PAT. PAT. OFF.

DOW CORNING CORPORATION
MIDLAND, MICHIGAN

DOW CORNING SILICONES

Atlanta • Chicago • Cleveland • Dallas • Los Angeles • New York • Washington, D. C.
In Canada: Fiberglas Canada Ltd., Toronto • In Great Britain: Midland Silicones, Ltd.

ALERT!

Getaway Fast!

When the red alert sounds there's no compromise for dependability, performance, and quick starts! That's why the light weight GLA *high energy condenser discharge system* is specified for the Air Force's fighting jets. These ignition systems combine advanced electronic development with unique space and weight saving design —each system is engineered to deliver maximum performance through the widest possible range of operating conditions.

Solving complex ignition problems and producing the equipment is our business. Our engineering department invites your inquiry. May we hear from you?

GENERAL LABORATORY ASSOCIATES INC.

NORWICH, NEW YORK

GLA

AIRCRAFT AND ELECTRONIC PRODUCTS

plating, stamping, machining and so on.

• **Airlines business** has swollen to the extent that many carriers are sending out their modification and overhaul work. Mallard Industries is negotiating with three airlines on this angle.

▶ **Conversion Production**—Conversion setup at Connecticut is on a production-line basis, which is facilitated by Hewitt's policy of purchasing and stocking numbers of the popular types of large transports—then selling them and the conversion in a package. In this way, with a line already arranged to work on a number of planes—five are now going through—he can continuously feed new work into it and arrange working schedules and procurement so as to permit strict cost analysis.

When the airplane is put on the line, it is lowered onto wooden forms which maintain the craft in a level position, with a clearance of 28 in. from nacelle to floor. This low, level placement makes working conditions inside the plane easier, and obviates the need for cluttering up the hangar with numerous work stands.

Only the bare fuselage and center section remains in the hangar in the early stages; ailerons, rudder, flaps, radio, etc., are all funneled into their respective shops for reworking. New ducting, flooring, bulkheads and so on are designed and fabricated. Engine and prop work is farmed out.

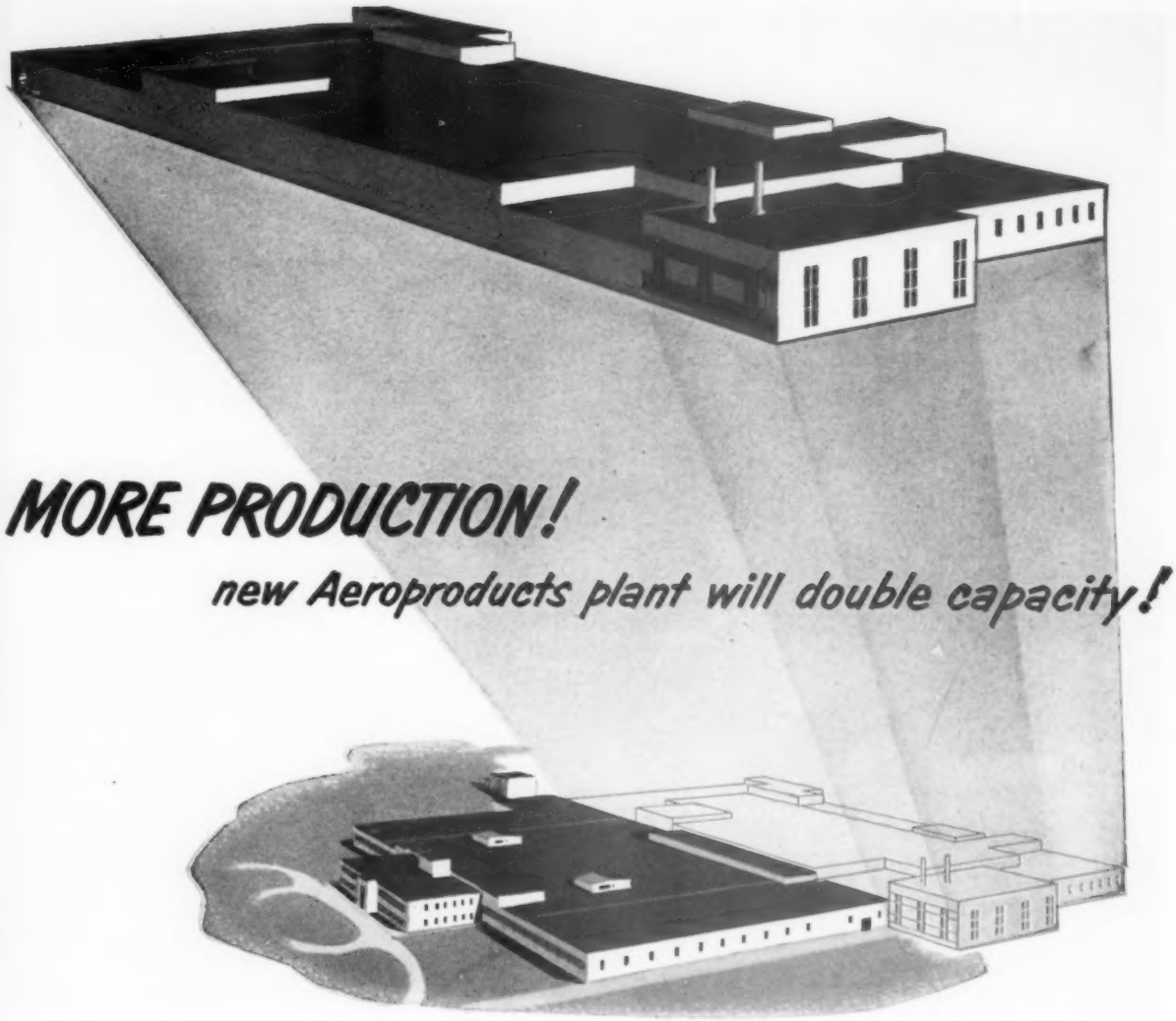
▶ **Conversion Package**—The conversion package is built around a "standard" Mallard design covering the plane's structure and equipment placement. The company is very weight-conscious and has worked out numerous engineering changes in the DC-3 to offset the usual penalties of plush interiors.

One of these modifications is to build up a new flooring of U.S. plywood honeycomb paneling, said to save 190 lb. over the previous DC-3 floor and have superior strength characteristics. This is particularly important in view of varied and unusual furniture and fittings arrangements called for.

Other standard company features are passenger doors with built-in steps, and a larger baggage hatch than is standard.

No little part of the Connecticut operation entails hangarage of corporation planes—there are 14 executive transports based there now, and the favorable location—only 20 min. flight time by Navion (for which Hewitt is a distributor) from Teterboro—makes it handy for executives.

Hewitt's known industrial leanings make interesting the speculation that, with all the experience Mallard Industries is gaining in the executive aircraft field, plus the fabrication know-how, excellent labor supply and shipping facilities, he may be saving a trump for future use—designing, building and selling his own executive plane design.



MORE PRODUCTION!

new Aeroproducts plant will double capacity!

Aeroproducts' huge expansion program is on its way. Ground has been broken for the new plant and *by the end of this year, present production capacity will be more than doubled!*

This rapid expansion of facilities will *more* than enable Aeroproducts to meet Air Force demands for Aeroprops on the giant Fairchild C-119 . . . *more* than meet the Navy's needs for turbine propellers on the Douglas A2D, the Consolidated Vultee R3Y and others. For Aeroproducts is planning for tomorrow . . . looking forward to a constantly increasing demand for its products. And whatever the future may hold, Aeroproducts will be ready—fully prepared to build propellers for giant new airliners . . . or for the swift-moving bombers, fighters and transports of our armed forces.

Yes, Aeroproducts, backed by the full facilities of General Motors, is ready to meet the demands of today... and is well on the way to meeting the accelerated demands tomorrow may bring.

GM GENERAL MOTORS

AEROPRODUCTS DIVISION
GENERAL MOTORS CORPORATION
DAYTON, OHIO

Building for today
Designing for tomorrow

Aeroproducts

Acclaimed by 400,000 Ocean Travelers!

In the two short years since the Boeing Stratocruiser made its first commercial passenger flight, it has become the undisputed choice of passengers in over-ocean travel.

Today the great twin-deck supertransport is as familiar a sight in Rio and London, Honolulu and Tokyo as in New York, Seattle or Los Angeles.

In operation on four major airlines, Stratocruisers have made 15,500 trips, carried 800,000 passengers, and flown more than 45,000,000 miles. *On over-ocean routes alone, they have transported nearly 400,000 people!*

The tremendous popularity of the Stratocruiser is easy to explain. More spacious than any competing aircraft, it offers ample room for passengers to move about in main cabin or lower-deck lounge. The finest altitude conditioning in any transport permits smooth, high-level flight with complete comfort. And Boeing-designed seating, lighting and dressing-room facilities add to the pleasure of Stratocruiser travel.

No other plane-builder can match Boeing's four-engine aircraft experience, proved in the performance of the early transocean Clipper flying boats and Stratoliners, the B-17 Flying Fortresses, B-29 and B-50 Superforts and C-97 Stratofreighters. People know the integrity of Boeing research, design and engineering. They like to fly in Boeing-built aircraft.

• Mechanical, electrical, aeronautical, civil engineers and physicists! Boeing has exceptional openings for you! Write Engineering Personnel, Boeing Airplane Company, Seattle 14, Washington.

BOEING

STRATOCRUISER

Operating Characteristics: Jet vs. Piston Transport

Profits and Utilization

	JET L-193	PISTON DC-6
Miles flown per year	18,400,000	18,400,000
Hours flown per year	40,000	71,000
Daily utilization	8.0 hr.	7.8 hr.
Average block speed	460 mph.	260 mph.
Number of planes needed	14	25
Miles per day per plane	3,680	2,020
Available seats per flight	64	52
Passenger load factor	70%	68%
Available seat miles per year	1,180,000,000	957,000,000
Passenger revenue potential per year @ 5.6¢ per passenger mile	$46,300,000	$36,400,000
Cost per year	$35,800,000	$29,700,000
Passenger operating profit	$10,500,000	$6,700,000

Runway Distance

	JET L-193	PISTON: CONSTELLATION	PISTON: DC-6	PISTON: STRATOCRUISER
Takeoff distance:				
Standard day	5,050 ft.	4,830 ft.	5,150 ft.	6,530 ft.
Army hot day	5,500*	5,200	5,550	7,450
2,500 ft. alt.	5,890	5,600	6,080	6,950 (a)
5,000 ft. alt.	6,830	6,930	6,520 (c)	7,310 (b)
Landing distance	4,980	4,810	4,640	6,420

* Partial afterburning compensates for loss of thrust on hot day. (a) Weight limited to 136,000 lb. (b) Weight limited to 128,500 lb. (c) Weight limited to 91,000 lb.

Source: Lockheed Aircraft Corp. estimates for American Airlines.

Cost per Seat Mile

	MILES: 500	1,000	1,500	2,000	2,500
Jet L-193:					
Direct	1.62¢	1.40¢	1.33¢	1.31¢	1.30¢
Indirect	1.58	1.58	1.58	1.58	1.58
Total	3.20	2.98	2.91	2.89	2.88
Piston DC-6:					
Direct	1.57¢	1.41¢	1.35¢	1.35¢	1.34¢
Indirect	1.68	1.68	1.68	1.68	1.68
Total	3.25	3.09	3.03	3.03	3.02

Traffic Pattern Speeds

(Maximum landing weight)

	JET L-193	PISTON: CONSTELLATION	PISTON: DC-6	PISTON: STRATOCRUISER
Pattern speed	175 mph.	150 mph.	150 mph.	175 mph.
Approach speed	136	121	124	145
Landing speed	120	91	90	105

Scheduled Flight Times

	JET L-193	PISTON DC-6
Los Angeles-New York	4 hr. 39 min.	8 hr. 49 min.
New York-Los Angeles	5 hr. 42 min.	11 hr. 13 min.
Chicago-New York	1 hr. 28 min.	2 hr. 50 min.
New York-Chicago	1 hr. 51 min.	3 hr. 30 min.
Los Angeles-Chicago	3 hr. 20 min.	6 hr. 25 min.
Chicago-Los Angeles	4 hr. 7 min.	7 hr. 30 min.

Airlines Told How Jets Can Make Money

Greater speed means more seat miles flown per year; this results in higher income, decreased plane fleet.

A switch now from piston-engine to jet transport orders will cut costs and bring in additional revenue for long-haul airlines, Lockheed Aircraft Corp. says. And Lockheed backs up its statement with detailed figures in a brochure on the proposed jet L-193, which it has sent to American Airlines, Trans World Airlines, Pan American World Airways, and others. To give immediacy to the sales talk, Lockheed says the new transport, despite its high-speed potential, will be able to operate in today's traffic pattern.

▶**Five Years to Delivery**—Lockheed claims a fleet of 14 64-passenger L-193s would relieve 25 DC-6s or Connies for air coach service by 1956 (five years from order to delivery on first L-193 order). And the 14 L-193s would clear $10,500,000 operating profit for American Airlines on regular-fare passenger service where the 25 DC-6s would make $6,700,000 a year.

Even on a route segment as short as 500 miles, Lockheed estimates its four-jet transport design would stay with the present-day DC-6 on total costs—direct and indirect. At a range of 2,000 miles, the jet would have a definite cost advantage—2.89 cents a seat mile compared to 3.03 cents for the DC-6, Lockheed estimates in its brochure to American Airlines.

Here is how Lockheed figures attempt to prove that the same services now offered on most routes and schedules by American Airlines DC-6s can be rendered by the L-193 with about half the number of planes and with higher operating profit.

▶**The Figures**—With 460-mph. block-to-block speed assumed for the jet against 260 for the AA DC-6, the 14 jets would fly the same number of plane miles a year as 25 DC-6s—18.4 million plane miles. With 64 seats available, the jets would haul 1,180 million available seat miles where the DC-6s would carry 957 million. At 5.6 cents a revenue passenger mile, 70-percent load factor, the jets would gross $46,300,000 where the DC-6s would gross only $36,400,000 at 68-percent load factor.

Operating cost—direct and indirect—would be $35,800,000 for the jets compared with $29,700,000 for the DC-6s. But the jets would gross $9,900,000 more revenue and cost only $6,100,000 more to operate. So operating profits on the same schedules would be $3,800,000 better on the jet—$10,500,000 passenger operating profit on 14 jets against $6,700,000 on 25 DC-6s, according to Lockheed analysis of AA's longer-haul routes.

▶**Who'll Be First?**—Despite Lockheed's hard-hitting sales pitch to American, observers say Trans World or Pan American will probably be the first U. S. airline to buy jets. Trans-Atlantic competition expected from Britain's jet transports sooner or later would force American lines to go jet, they say.

The question is when—five years? or more? Lockheed estimates it will take five years from the first order to produce a fleet of L-193s. That is because the manufacturer will not build a prototype without an order. So the manufacturer must go through both preliminary engineering and production engineering phases before starting production. And the L-193 design calls for turbojet engines of 12,200-lb. static thrust each. No such engine is operational yet, though several are in development stage and should be ready by the time the L-193 airframe could be ready.

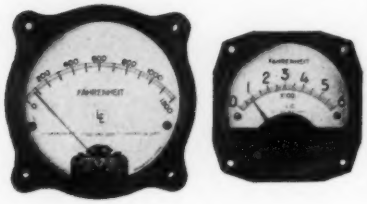
▶**British Progress**—Even the British are a long way from large-scale jet operation on the competitive trans-Atlantic run. British Overseas Airways has 14 de Havilland Comets on order. But only four may have enough range to span the Atlantic on scheduled service. These are the four Mark IIs that will get Rolls-Royce Avon engines instead of

LEWIS
Indicating Pyrometers

for temperature testing in the laboratory or in the plane...

Constructed with the same care as our aircraft temperature indicators, these pyrometers bring "aircraft quality" to the test engineer.

MODEL 58PY, above, has been used extensively by leading motor car manufacturers for road testing on the "Proving Grounds" — where performance counts. Housed in rectangular bakelite case, has 6" hand drawn scale and is fully compensated for ambient temperature. Made in ranges listed below, with suitable thermocouple materials.



MODEL 23B, left above, has same type movement as our aircraft pyrometers. Housed in flanged, 4" round, bakelite case for panel mounting.

MODEL 20B, right above, has same 3" steel case and same movement as our aircraft panel indicators. Both are fully cold-end compensated and available in standard ranges listed, with suitable thermocouple materials.

STANDARD RANGES—All Models
FAHRENHEIT
Zero to 400, 600, 800, 1000, 1200, 1600, 1800, 2000 and 2500.
CENTIGRADE
Zero to 200, 300, 400, 500, 600, 800, 1000, 1100 and 1400.

Furnished with white scales, black markings and pointer or, with black scales white markings and pointer if specified. For best results use LEWIS Thermocouples, Leads and Selector Switches with these instruments.

THE LEWIS ENGINEERING CO.
Manufacturers of Complete Temperature Measuring Systems for Aircraft
NAUGATUCK, CONNECTICUT

the de Havilland Ghost engines going in the other ten Comets on order for BOAC. All 14 Comets are now scheduled to be delivered by the makers by early 1953.

BOAC reportedly plans to use the turboprop Bristol 175 (normal range 2,700 miles) as standard work horse on the trans-Atlantic run. But that plane has not yet made its first flight.

So the British, like the Americans, may be tentatively planning a turboprop phase for trans-Atlantic service, before going over to pure jets.

But recent rapid improvement of jet fuel economy may change both British and American plans. The jet transport picture is still uncertain, but it looks closer than ever before, recent developments indicate.

▶ **The Jet in Traffic**—Lockheed's L-193 brochure makes a big point of the near-normal traffic and landing speeds of its proposed 625-mph. jet transport. Holding-pattern speed is 175 mph., the same as the Boeing Stratocruiser. Approach speed is 156 mph., only about 10 mph. higher than the Stratocruiser. Landing speed, 120 mph., is 15 mph. faster than the Stratocruiser, but the jet will stop 1,440 ft. shorter than the Stratocruiser on the landing runway, Lockheed estimates show.

This would enable the jet transport to operate right in the middle of a piston-engine traffic pattern, according to Lockheed.

TWA, C&S Told to Hurry Interchange

Trans World Airlines and Chicago & Southern finally took their proposed New York-Houston interchange to a Civil Aeronautics Board prehearing conference.

The two airlines have had a hard time deciding how to schedule the service and still keep efficient equipment utilization. They asked CAB for a postponement. But the Board told them they had better hurry their decision or the proceeding might be closed on them.

Chief gainer from the proposed through service would be Pittsburgh, which now has no speedy route to Houston. The inerchange route is New York-Houston via Pittsburgh, Indianapolis or St. Louis, and Memphis.

Chicago & Southern also has another interchange pending—Pan American-C & S between Chicago and Mexico City via interchange slated to take place at Houston.

Joseph Mashman, of Bell Aircraft's Helicopter division, recently returned from Korea, where he spent four weeks checking up on Bell helicopters operating with various USAF, Marine and Army units.

Speed Copter Work, ACC Group Urges

A report by the Air Coordinating Committee's Helicopter Working Group calls for a speed-up in commercial copter development. The group makes specific and policy recommendations to all government agencies which can help copter development.

The report will probably go to the full Air Coordinating Committee for approval or modification within a month.

The ACC working group under CAA transportation economist Richard Waldo is putting the finishing touches on the report now.

Here's what the inter-agency ACC will probably recommend:

• **CAA should promote** copter development by such moves as using prototype testing money, providing federal aid for local heliports when needed, and certificating new copter designs without too much red tape. The ACC Helicopter Working Group has already recommended that the Prototype Aircraft Advisory Committee ask CAA to request money for fiscal 1952 testing—by such metropolitan air operators as Los Angeles Airways. (CAA Prototype Committee is asking $480,000 for copter tests on metropolitan service, AVIATION WEEK June 11, p. 14.)

CAA should also plan federal airways and traffic control for high-volume copter use.

• **CAB should get aggressive** in fostering metropolitan air service growth. CAB is due to decide on a New York copter certificate soon. Copter authority at CAB is Examiner Ferdinand Moran, who recommended that the Board speed certification of New York Airways—now for mail and cargo, and as soon as possible for passenger service. With Los Angeles, Chicago and New York already well on the way to passenger copter service, CAB should then take the initiative in promoting in other large metropolitan areas. CAB should also study the impact multi-engine copters will have on all short-haul routes.

• **NACA should step up** rotary-wing basic research, the ACC group believes. NACA is reportedly going along at the pre-Korea pace on copter development, while both military and commercial operations now indicate need for intensified development.

• **Defense Department must permit** deliveries of a limited number of commercial airline copters and would also do well to lend some copters for commercial-use tests. The knowledge gained would help military development.

• **Post Office should use** available metropolitan copter services, ACC says. And the PO should continue close

scrunity of mail appropriation riders that snipe at the "uneconomic" expense of copter mail service. PO should make full use of those new copter services CAB may certificate in the future.

• **Helicopter development** can also get a boost from other government branches like the Coast & Geodetic Survey, Interior Dept. and Agriculture Dept. These agencies can push commerical development by using helicopters wherever it is practical in their business.

United to Launch Fog-Chasing Trials

United Air Lines will launch a fog-dispersal experiment this fall. By dropping chemicals from a plane, UAL hopes to clear enough fog on occasions to get into closed airports.

UAL has let a research contract to ex-Navy fliers Harvey M. Brandau and Eugene K. Kooser, who have experimented with a "Formula X" in Oregon since 1949.

They will use a UAL DC-3 with special gear to diffuse the chemicals to be used in the test.

UAL says inconclusive tests of "Formula X" were made for United at Medford, Ore., earlier this year. United says the tests this fall "will disclose if the Brandau-Kooser method has practical application to scheduled operations."

The Air Force investigated a similar fog-dispersal method in the mid-1940's. They rejected it for general Air Force use. Main reason was the destructive effects of the chemicals when they reach the ground. The chemicals, an Air Force spokesman says, may corrode parts of aircraft spotted on the airport and hurt nearby vegetation. But the chemicals did disperse fog and low stratus to a limited extent according to the USAF.

Civil Priorities Changes Coming Up

Civil aircraft priorities planners at Commerce Undersecretary Rentzel's office are increasing controlled materials allocations and simplifying paperwork for the third-quarter civil aircraft program under CMP. It was expected last week that the Aircraft Production Board at DPA would approve the revisions.

Chief planned CMP procedural changes and program increases are designed to:

• **Avoid material shortages** that industry says will turn up in the CMP allocation originally cut 20 percent for the third quarter.

• **Let prime manufacturers** lump civil and military allocations to pass on to subcontractors of A-products. Procedure now in the works would let both civil and military allocations be treated as a joint bank of materials supply by the manufacturer. Materials would carry the same symbol, instead of being earmarked civil and military, for materials allocations accounting at the plant. And the prime contractor could allocate them in the same way to the subcontractors of secondary A-products.

• **Change the B-product list.** Plan is for Walter Skuce, National Production Authority's CMP-planner, to redesignate certain aircraft products on the B-list. Whole aircraft on the present list are of two types: commercial and personal.

Personal aircraft makers on the present list are supposed not even to file for controlled materials. But 2,000 of their planes are deemed essential to industry and have DPA program approval. Revised title would break down the listing the same way as the production program is split: air carrier type planes, and non-air-carrier type planes. The allocations on non-air-carrier planes and parts will be figured by use, with allocations for essential users.

Another plan is to get some common components used by the military placed on the B-list. Most of the confusion on the present B-list is between type of unit (common or custom-built) and customer (military or civil). The definition of a B-list item is: any standard product. Thus, many common aircraft and other components used for military planes belong on the B-list.

• **Let non-air-carrier plane makers** build more than the 2,000 planes that already have material specification allocations under DPA Program Determination No. 29. The manufacturers may be allowed to build more planes by getting materials in the "open area" to add to the materials allocation under the CMP program.

Capital Wants in on N.Y.-Mexico Route

Capital Airlines wants to start a New York-Mexico City through-service interchange. It would compete with American Airlines only.

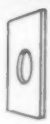
American now has a monopoly on one-plane service, New York-Mexico City. Capital asks CAB to order a Capital-Chicago & Southern-Pan American interchange via Memphis and Houston. PanAm and C&S are already at the hearings stage on their old Chicago-Mexico City interchange proposal.

Capital wants CAB to consolidate the Capital proposal for New York-Mexico City service with the C&S-PanAm docket for Chicago-Mexico City already in the works.

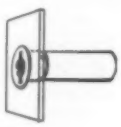
DILL
LOK-SKRU
•• THE BLIND
Anchor Nut
or
Rivet

Complete Installation in Seconds

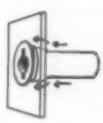
1 Drill one (1) hole.



2 Insert Lok-Skru with either Hand or Power Lok-Skru Tool.



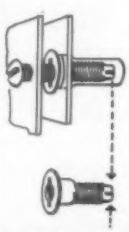
3 With Lok-Skru Tool draw barrel over shoulder of Lok-Skru and flush with metal. This provides a Blind Anchor Nut for Secondary Attachments.



4 TO FASTEN ATTACHMENTS insert standard Machine Screw through hole in attachment and into Lok-Skru.

As machine screw is tightened into Lok-Skru it is securely locked by means of the "Specially Crimped" locking-end of the Lok-Skru.

Crimped internal threads of Lok-Skru provide secure locking device for attachment screw.



THE AVIATION STANDARD

for Screw Locking Anchor Nut Uses and Metal to Metal Fastening.

Write for Folder

Handy information on the many uses and application of Lok-Skrus in airplane construction with complete data on types and sizes.

THE DILL MANUFACTURING COMPANY

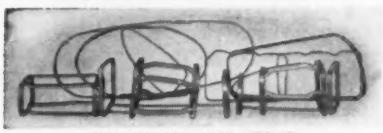
FACTORY
700 East 82nd St.
Cleveland 3, Ohio

BRANCH
1011 S. Flower St.
Los Angeles 15, Calif.

UNITED STATES MOLDED SHAPES
INCORPORATED

FABRICATORS OF MOLDED BOAT SHAPES AND AIRCRAFT PRODUCTS

FROM VENEER AND FIBERGLASS



MOLDED PLYWOOD FORMS

Molded plywood and fiberglass are versatile aircraft construction materials. We have produced the following parts for leading aircraft manufacturers.

Wing sections
Nose cowlings
Engine nacelles
Leading edges
Wing tips
Empennage
Radar housing domes
Gunners' shields
Dropable veneer gas tanks
Helicopter spars
Central fire control seats
Polystyrene spinners for aircraft props

The Famous
'RAVEN'
MOLDED HULLS
Made By
U. S. MOLDED SHAPES, Inc.

The 'Raven', 'Thistle', 'Wolverine', and many other famous boats use U. S. Molded Hulls.

Molded plywood and fiberglass are proven substitutes for critical materials, even superior in many respects. We invite you to submit your problems and specifications to our engineering department.

Write or Wire Us Today!

UNITED STATES MOLDED SHAPES INC.
GRAND RAPIDS, MICHIGAN

CAB Seeks Mergers To Aid Air Transport

The airlines and the Civil Aeronautics Board may be overexpanding the air transport industry to meet an abnormal short-term demand, just as they did in 1946, CAB vice chairman Oswald Ryan warns in a speech to industry and government at Purdue University.

Ryan advocates CAB-proposed mergers as the best immediate way to strengthen the industry.

Ryan urges two policies for CAB to make the air transport business ready for a traffic slump: stop uneconomic competition; and integrate the airlines' route patterns by mergers and other means.

Ryan concedes that low fares are the big spur to airline business. But he ties any lowering of fares to further reductions in operating costs. Here are the two main policies he urges on CAB to help reduce airline costs:

• **Reduce competition,** on over-scheduled routes. Ryan points out that among the routes now under CAB investigation of uneconomic competition are Twin Cities-Washington, Detroit-Washington, Chicago-Washington, Detroit-New York. The Board should eliminate excessive services, Ryan declares.

• **Propose mergers** to eliminate unnecessary duplication of service by the airlines. Ryan says that while CAB can't compel a merger, "There would seem to be a reasonable chance that the carriers would cooperate in the public interest in carrying out the Board's recommendations." Ryan urges the CAB to make immediate use of its route pattern studies (by route division chief Bernard Slebos). Ryan thinks the Board should now propose the mergers that would make the weaker trunk lines more self-sufficient. He believes that after full hearing, the airlines urged to merge would see the advantages of the proposed mergers or consolidations, and follow CAB recommendation.

Ryan makes his warning of impending overexpansion stick by a final point in his speech: Sharp and long airline slumps can occur even when the U. S. economy in general is doing fine, as happened in 1946-8. He says present traffic, as in the World War II and early postwar periods, is considered abnormally high.

2 More Carriers Get U. S.—Alaska Rights

To provide more air service to Alaska, CAB has certificated U. S.-Alaska routes for two more carriers—Pacific Northern Airlines and Alaska Airlines—by request of President Truman.

CAB had planned to certificate only Pacific Northern. (Pan American World Airways and Northwest Airlines are already operating U. S.-Alaska.)

CAB sent its decision adding Pacific Northern to the President on Sept. 29, 1950; Truman approved this but added two conditions: authorize Alaska Airlines on U. S.-Alaska service, too; and start a CAB study on Alaska's need for air service, to set up a permanent Alaska air service policy and pattern.

The CAB certification of both Pacific Northern and Alaska Airlines for U. S.-Alaska service expires Dec. 13, 1953; that is the same date as Northwest Airlines' Alaska route expires. CAB plans to have its Alaska service study finished by that date, so it can then set up a permanent Alaska policy and route pattern, as the President has been requesting.

Pacific Northern is authorized between Anchorage and the coterminal points Portland and Seattle, via intermediate stops at Juneau, Yakutat and Cordova. Alaska Airlines is authorized between Fairbanks and Seattle/Portland direct. Northwest Airlines operates Anchorage-Seattle. Pan American has permanent authorization Fairbanks-Seattle.

President Truman gave two reasons for asking CAB to add Alaska Airlines as a fourth certificated U. S.-Alaska carrier, and asking CAB to start a study of Alaska service. His reasons are: 1. "Particularly the need for air transport services to Alaska arising directly out of national defense activities;" and 2. "The direct contribution which the fullest (commercial) development of Alaska would make to the national defense."

Pioneer Asks CAB For Route Extension

Pioneer Air Lines has asked CAB for 2,600 miles of route extensions to 31 new cities, including about all of Central Air Lines' present and proposed routes.

Pioneer president Robert J. Smith says this doesn't mean he opposes CAB renewal of Central's certificate. "However," Smith says, "If CAB fails to renew the operating certificate of Central, Pioneer wants to provide the service." (Centrals renewal probably will not be decided on by CAB for another year, observers say.)

Other local service airlines Trans-Texas and perhaps Ozark are now expected to ask for all or part of Central's routes, too.

Pioneer's request to CAB asks for 31 new cities in five states—Texas, Oklahoma, Kansas, Arkansas and Louisiana. Pioneer now serves 22 cities in two states—Texas and New Mexico—over 1,873 route miles.

SHORTLINES

▶**Aer Lingus**—Irish airline has flown 14 million plane miles without a fatality. Passengers carried numbered 920,000. Company operates 14 DC-3s.

▶**Alaska Airlines**—Newly certificated for Fairbanks-Seattle scheduled service, Alaska Airlines plans to use the Seattle-Tacoma International Airport. It has been using Paine Field, north of Seattle, for its nonsked operations. Paine will still operate as a primary maintenance base.

▶**American Airlines**—AA has started its second daily transcontinental air coach DC-6 service. This one is N. Y.-Los Angeles via Dallas instead of Chicago. Fares from New York: $90 to Dallas, $110 to L. A.

▶**British European Airways**—BEA may operate the 100-passenger, 330-mph.-cruise Bristol Brabazon on high-density routes. But the plane still needs more development work before it can go into commercial service.

▶**Chicago & Southern Air Lines**—C&S has put its sixth 57-passenger Constellation in operation on its scheduled service.

▶**International Air Transport Assn.**—Newly elected chairman of IATA's important Technical Committee is J. C. Kelly-Rogers. He is assistant general manager (technical) of Aer Lingus. He started as an airline pilot in 1935. . . . Among the questions facing the Technical Committee is the matter of standardizing approach light systems. British have used the pilot-favored center-line system for years; U. S. airline pilots want it; but USAF says center-line is an obstacle in the approach and takeoff zones. CAA says it doesn't care what system is used, but is installing left-hand row because USAF does not want center-line.

▶**Trans World Airlines**—President Ralph Damon says TWA will probably not be far behind the British whenever they really start jet transport service volume across the Atlantic. Right now, he says, range is insufficient, fuel economy is poor, costs are too high. While American manufacturers quote up to five years from first contract to produce numbers of trans-ocean-range jet transports, that is probably only because of tight personnel and materials supply due to military orders, he says. . . . Record TWA traffic day June 3 totted up 6,475,425 passenger miles, of which 5,212,425 was domestic.

ENGINEERS

wanted at once

for

LONG-RANGE MILITARY AIRCRAFT PROGRAM

by

NORTH AMERICAN AVIATION, INC.

Los Angeles, California

Columbus, Ohio

Unusual opportunities for Aerodynamicists, Stress Engineers, Aircraft Designers and Draftsmen, and specialists in all phases of aircraft engineering. Engineering skills other than aircraft may be adaptable through paid training program. Also openings for

Recent Engineering College and Technological Graduates

Long-range military program offers fine chance for establishing career in aircraft while aiding defense effort. Transportation and established training time paid. Salaries commensurate with experience and ability.

Please include summary of education and experience In reply to:

Engineering Personnel Office
SECTION 3

NORTH AMERICAN AVIATION, INC.

Los Angeles International Airport
Los Angeles 45, Calif.
or
Columbus 16, Ohio

The Mark of Quality

TMI

A DECADE OF PRODUCTION

OF SMALL DIAMETER

STAINLESS STEEL TUBING

Proves one paramount point: When you need precision cold drawn tubing, Tube Methods is your logical choice. With emphasis on QUALITY instead of TONNAGE . . . leaders in aviation have found TMI a dependable source . . . a specialized manufacturer featuring

PIASECKI

"The Fastest Growing Company In The Industry"

N-e-e-d-s

DRAFTSMEN

and

ENGINEERS

With Aircraft EXPERIENCE

On

- **AIRFRAMES**
- **CONTROLS**
- **ELECTRICAL INSTALLATION**
- **POWER PLANT INSTALLATION**

Also

STRESS, WEIGHT and VIBRATION ENGINEERS

Premium Pay for Overtime, Excellent Company Benefits, Paid Vacation & Holidays. Real Opportunity to Advance With a Leader in The Rapidly Expanding Helicopter Industry.

WRITE, GIVING DETAILED RESUME OF EXPERIENCE & EDUCATION TO—

Engineering Personnel Manager

PIASECKI HELICOPTER CORP.

MORTON, PA.
A Philadelphia Suburb
NEAR SWARTHMORE

SIDELIGHTS

(Continued from page 8)

State Dept. Projects

Chief State Dept. **air activities** now are: (1) mobilization plans among our allies; (2) negotiating an air transport agreement with The Netherlands; (3) preparing for the ICAO assembly in Montreal; (4) asking route adjustments in the New Zealand agreement; (5) trying to get Venezuela to ratify its bilateral air transport agreement with the U. S.

Army Steers Clear of USAF

Army Field Forces is insisting on CAA certification of any helicopter before it will place an order for the craft. AFF has no aeronautical engineering establishment comparable to that of USAF, prefers not to depend on USAF's Wright Field engineering division for evidence of the copters' airworthiness and performance. Frankly, Army doesn't think USAF knows what craft Army needs.

Storage for Old Admirals?

Some concern has been expressed that abolition of Navy's **General Board** might have some effect on Naval aviation, presumably because of similarity in name to USAF's powerful Senior Officers Board. The General Board was set up in 1900 to advise the Secretary of the Navy on conduct of the Spanish-American War. Later it became a formally organized group to advise (but with no authority) the Secretary on matters concerning military characteristics of ships and after 1935, to some extent, aircraft. It never was considered a very effective organization because of its lack of authority, plus the fact that its personnel were unassigned, with no other duty. During World War II it fell into disuse and just faded away to a status of—in the words of one spokesman—"a convenient place to store old admirals before retirement."

Where's the X-2?

Progress on the **X-2**, being built by Bell Aircraft Corp., has been slower than anticipated, but the plane still is expected to fly in 1951. Or so NACA's Hugh Dryden told senators in appropriations hearings.

Washington Talk

They do still say that **W. Stuart Symington** keeps his eyes on the post of Secretary of Defense, if and when Marshall leaves. But he won't have clear sailing, apparently, because West Coast senators are still irate over the industrial dispersal program Symington pushed at his USAF and NSRB jobs. . . . . Meanwhile, Undersecretary **Dan Kimball's** is the only name persistently mentioned as successor to Navy Secretary Francis Matthews. Matthews is being urged by Truman to take over the diplomatic post to Ireland and many Navy people hope he goes. Matthews has not fought vigorously for Navy in Washington. . . . And **Adm. Forrest Sherman's** "everything is fine with the Administration" testimony before the Senate reinforced the prospect he will become the new chairman of the Joint Chiefs of Staff when Gen. Bradley's term expires in August, although it's understood the President would not object if Bradley stays on. Aviation people remember in 1938, when the "Battleship Admirals" in control of the Navy insisted on Congress writing a stipulation into money bills limiting the number of Naval planes to 3,000 it was Sherman who fought to get it stricken out. Sherman, during the postwar unification fight, again challenged the Navy high command by vigorously supporting the plan. Sherman and USAF's Lt. Gen. Lauris Norstad are given credit for being among the chief authors of the Unification Act.

More School Contracts Seen

Approval of UMT legislation has cleared way for congressional consideration of reserve and ROTC bills that will probably involve a large-scale **flight & technician training** under contract with civilian schools. Reserve legislation, now being drafted by Defense Dept., is first on the agenda. Aeronautical Training Society recommends that such legislation include contract flight and technician training. But it seems doubtful the new laws will provide this. ROTC legislation, already cleared by Defense, and introduced by Rep. Overton Brooks (on House Armed Services Committee) and Sen. Russell (chairman of Senate Armed Services Committee) does authorize the services to provide flight training by contract with civilian schools.

Civil Aviation

National Air Taxi Conference opens GHQ at 1346 Connecticut Ave., N.W., Washington, D. C., in association with National Aviation Trades Assn. Miss Evelyn Waters is secretary and Charles A. Parker, executive director of NATA, will supervise activities, pending further progress. Robert Northington of Piedmont Aviation, has succeeded Joseph Garside, Wiggins Airways, as president. Certified taxi operators now number 52 and membership is expected to increase. . . . NAA announces acceptance by Federation Aeronautique Internationale of **two new international plane records** set by women pilots. Jackie Cochran set a new speed record for piston-engine planes at 464.374 mph., an average of two consecutive passes in each direction over a 16-kilometer course near her ranch at Indio, Calif., at 25,000 ft. in an F-51 with a Packard-Rolls-Royce Merlin 1,450-hp. engine. Mrs. Ana Louise Branger set a new altitude record for planes weighing less than 1,100 lb. gross (including pilot and instruments) by attaining 27,152 ft. in a stock Piper Super Cub with a Lycoming 0-290-D 125-hp. engine. . . . CAA Administrator **Charles Horne** has promised to try to get a better break for private flyers and their planes in the Controlled Materials Plan and Mobilization Plan. He is "convinced civil aviation will continue without restriction until the advent of war, and we are convinced that during war, under the proper security controls, civil aviation can render exceptionally valuable services."

AVIATION CALENDAR

June 18-July 6—Three-week Air Age Institute course, Parks College of Aeronautical Technology of St. Louis University, East St. Louis, Ill.

June 21-22—Second annual local air service Seminar, Purdue University, Lafayette, Ind. For details write Jim Ray, 1507 M St., N.W., Washington, D. C.

June 21-22—1951 Cessna distributors meeting, Region E, Mapes Hotel, Reno, Nev.

June 22—Dedication of Downtown Airport, lake front, Milwaukee, Wis.

June 23—1951 British National Air Races, Hatfield Aerodrome, Hertfordshire, for light, heavy craft, and jets.

June 23-24—Air fair, Williamsport municipal airport, Pa.

June 25-30—Armed Forces Small Business and Subcontractors' Clinic, Will Rogers Coliseum, Fort Worth, Texas. For information, write: Project Officer, Armed Forces Small Business Exhibit, P. O. Box 9038, Fort Worth.

June 27-28—1951 annual summer meeting, Institute of Aeronautical Sciences, IAS Western Headquarters Bldg., 7660 Beverly Blvd., Los Angeles.

June 27-29—Mid-year meeting of officers and directors of Aviation Distributors and Manufacturers Assn., The Homestead, Hot Springs, Va.

June 28-30—Seventh annual national meeting of the Institute of Navigation, New Yorker Hotel, N. Y. C.

July 4-12—National soaring contest, Elmira, N. Y.

July 17-18—European ignition conference, sponsored by Lodge Plugs, Ltd., Savoy Hotel, London, England.

Aug. 15-19—Fifth annual all-woman transcontinental air race, sanctioned by the Ninety-Nines, Santa Ana, Calif., to Detroit, Mich.

Aug. 18-19—National Air Races, Detroit.

Aug. 22-24—Western convention of Institute of Radio Engineers and Seventh Annual Pacific electronic exhibit.

Aug. 22-26—International convention of the Ninety-Nines, Mackinac Is., Mich.

Aug. 24-26—Fifth annual convention of the Air Force Assn., Ambassador Hotel, Los Angeles, Calif.

Sept. 3-7—Royal Aeronautical Society-IAS third international aeronautical conference, Brigton, Sussex, England.

Sept. 10-14—Sixth national instrument conference and exhibit, sponsored by the Instrument Society of America, Sam Houston Coliseum, Houston, Tex.

Sept. 10-15—Seventh annual general meeting of the International Air Transport Assn., Westminster School, London, England. Program includes one-day visit to SBAC Farnborough show.

Sept. 11-16—Twelfth flying display and exhibition of the Society of British Aircraft Constructors, Farnborough, England.

Oct. 2-4—Seventh annual aircraft spark plug and ignition conference sponsored by the Champion Spark Plug Co., at Toledo.

PICTURE CREDITS

9—(top) Republic; (center) Allison division, GM; (bottom) Republic; 13—(top) USAF; 14—(Kenney) USAF; 17—Bell; 39—NACA; 77—Smith-Coda.

Airloc
sticks its neck out
for SAFETY
You can see when Airloc is not fastened; its head sticks up as a warning. A quarter turn of the stud and you know this positive-locking fastener is tight, flush and safe. Spring tension keeps it locked even under extreme vibration, compensates for variations in material thickness. Flush or round head type for cowlings, fairings, inspection plates, etc.; wing-stud and ring types for interior installations. Full range of sizes and special designs. Catalog on request.
MONADNOCK MILLS San Leandro California
Monadnock, with a wealth of fastening experience, also welcomes inquiries from manufacturers seeking reliable development and production facilities.
Made to conform to United States Air Force Specification MIL-F-5591.
Simple 3-piece construction . . . receptacle, stud and pin.

Is Interesting Work Important to You Do You Want a Promising Future ?

THEN:

Let us tell you about America's Newest, Youngest, most promising industry

HELICOPTERS

There are a few excellent opportunities open with a pioneer helicopter company. We want the best for a long-range program. A program that looks to the future. Space limitation does not permit full particulars but if you are an

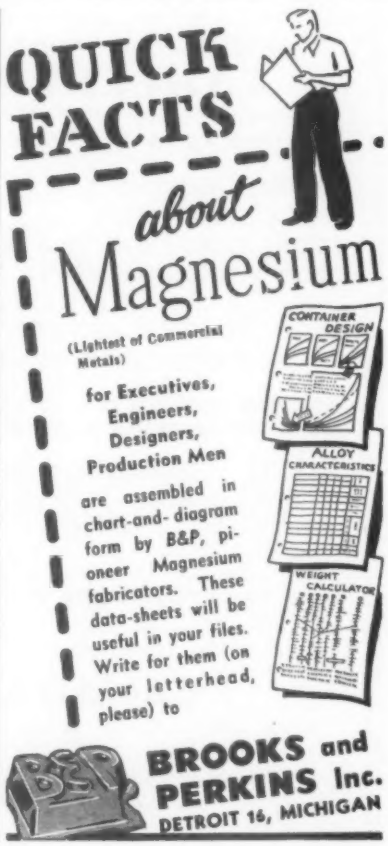
Aeronautical or Mechanical ENGINEER or DESIGNER

who wants to see where he is going we would like to tell you of the excellent opportunities in America's newest industry.

Submit qualifications and experience to
Mgr. Engineering Personnel
Helicopter Division

BELL AIRCRAFT CORPORATION

P. O. Box 1 Buffalo 5, N. Y.


QUICK FACTS about Magnesium
(Lightest of Commercial Metals)
for Executives, Engineers, Designers, Production Men
are assembled in chart-and-diagram form by B&P, pioneer Magnesium fabricators. These data-sheets will be useful in your files. Write for them (on your letterhead, please) to
CONTAINER DESIGN
ALLOY CHARACTERISTICS
WEIGHT CALCULATOR
BROOKS and PERKINS Inc.
DETROIT 16, MICHIGAN

ENGINEERS

Career Positions for Qualified Men

in

Baltimore, Maryland

AERODYNAMICS ENGINEERS

2-6 Years' Experience

Aerodynamic testing, design and development. Wide variety of progressive projects, including missiles, flying boats, guidance systems, high-performance military airplanes, commercial airplanes, proposals and research contracts.

STRUCTURES ENGINEERS

Openings in all classifications in the wide variety of progressive projects noted above.

POWER PLANT ENGINEERS

3 Years' Experience

Jet engines analysis, design and test background.

CABIN CONDITIONING ENGINEERS

3 Years' Experience

Housing Ample—Rentals Reasonable

THE GLENN L. MARTIN COMPANY

EMPLOYMENT DEPARTMENT **BALTIMORE 3, MARYLAND**

AC SPARK PLUG DIVISION

of

GENERAL MOTORS CORPORATION

PRECISION INSTRUMENT PLANT

Positions now available for highest caliber personnel in the field of airborne automatic electro-mechanical control equipment.

MECHANICAL DESIGN ENGINEERS
ELECTRONIC ENGINEERS
SERVO ENGINEERS
JUNIOR ENGINEERS

New and expanding division of an established firm with 20 years of successful experience in the instrument field. Work involved deals with the manufacture and development of highly complex equipment of the most advanced type.

Write or Apply

AC Spark Plug Division

GENERAL MOTORS CORPORATION

1925 E. Kenilworth Place
Milwaukee 2, Wisconsin

CAREERS IN CANADA

are open to competent and experienced

AERODYNAMICISTS	STRESS ANALYSTS
WEIGHTS ENGINEERS	DYNAMICS ENGINEERS
MECHANICAL ENGINEERS	STRUCTURAL ENGINEERS
PRODUCTION ENGINEERS	STANDARDS ENGINEERS

STATIC TEST ENGINEERS
POWER PLANT INSTALLATION DESIGNERS
HYDRAULICS AND LANDING GEAR DESIGNERS

Attractive openings in a variety of interesting assignments in a stable and expanding organization.

Ideal location in suburban Montreal near Canada's winter and summer Laurentian Playground

Apply

giving resume of training and experience

to

CANADAIR LIMITED

P. O. Box 6087
Montreal, P. Que.
CANADA

CHIEF STRESS ANALYST

Highly responsible position open to qualified stress engineer.

Applicants must hold a degree in engineering and have a minimum of 10 years' experience in airframe stress work, the last 5 of which should be supervisory in nature.

The man selected will head a growing stress group engaged in the analyses of helicopter airframes as well as related structural and mechanical components.

Send detailed resume to

Personnel Manager

THE KAMAN AIRCRAFT CORPORATION

Windsor Locks, Conn.

Openings for

ENGINEERS

in

CALIFORNIA

Positions now available for experienced aircraft engineers

ELECTRONIC SPECIALISTS
RADAR TECHNICIANS
AERODYNAMICISTS
AIRCRAFT DESIGN ENGINEERS
STRESS ENGINEERS
DRAFTSMEN

SPECIALISTS IN AIRCRAFT ENGINE EXHAUST SYSTEM DEVELOPMENT

with background in

Thermodynamics and Combustion

Send resume of experience and technical training to Director of Engineering

RYAN AERONAUTICAL COMPANY

Lindbergh Field
SAN DIEGO, CALIFORNIA

AEROELASTIC ENGINEER
Wanted

Permanent research opportunity for qualified Engineer with thorough background in Aeroelasticity including flutter and vibrations. Three to five years experience preferred.

C. Desmond Pengelley
Southwest Research Institute P.O. Box 2296
San Antonio, Texas

ENGINEERS

GOODYEAR AIRCRAFT

Goodyear Aircraft Corporation, one of the oldest aircraft development organizations in the field, now offers unusual opportunities to engineers, qualified through educational background and experience, in all phases of aircraft design and development.

A foremost producer of military aircraft during World War II, Goodyear Aircraft is continuing its long-range program for the development, design, and manufacture of a highly diversified line of products. In addition to currently manufacturing airplanes and airships, the company also designs and builds a number of vital components, including wheels and brakes, plastic aircraft components, guided missiles, radar, and other materiel for the defense program.

The diversification of products at Goodyear Aircraft Corporation has resulted in an unusually stable and progressive organization throughout postwar years.

You are invited to investigate these opportunities by submitting a resume of your qualifications and experience, which will be given prompt and serious consideration.

Address all correspondence to Mr. C. G. Jones, Salary Personnel Department.

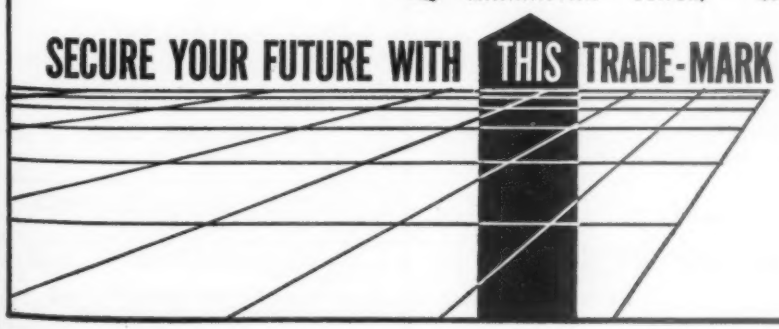
GOODYEAR AIRCRAFT CORPORATION

AKRON 15, OHIO

American helicopter co. inc.

MANHATTAN BEACH, CALIF. • MESA, ARIZONA

SECURE YOUR FUTURE WITH THIS TRADE-MARK



We are proud of its achievements. The first successful pulse-jet-propelled helicopter manufacturer. Now located in the heart of Arizona vacationland. We are offering a few excellent opportunities to project and engineering specialists with 5 to 10 years' helicopter experience. Positions are also open for power plant development and fuel control system specialists.

Please write or wire home offices at Manhattan Beach, California.

STRUCTURAL and STRESS
ENGINEERS

Must have three or more years' experience on the above. You may have your choice of either our

AIRPLANE
GUIDED MISSILES
or
HELICOPTER AND PROPULSION
DIVISION

Top starting pay . . . rapid advancement based on individual merit . . . liberal employee benefits . . . bonus for extended work week.

Send resume of training, experience and date available to:

McDONNELL AIRCRAFT CORPORATION

P. O. Box 516 — St. Louis (3) Missouri

Wanted

ENGINEERS
AND
SCIENTISTS

Unusual opportunities for outstanding and experienced men.

These top positions involve preliminary and production design in advanced military aircraft and special weapons, including guided missiles.

Immediate positions include:

Electronic project engineers
Electronic instrumentation engineers
Radar engineers
Flight test engineers
Stress engineers
Aero- and thermodynamicists
Servo-mechanists
Power plant installation designers
Structural designers
Electro-mechanical designers
Electrical installation designers

Excellent location in Southern California. Generous allowance for travel expenses.

Write today for complete information on these essential, long-term positions. Please include resume of your experience & training. Address inquiry to Director of Engineering.

NORTHROP AIRCRAFT, INC.
1003 E. Broadway
Hawthorne (Los Angeles County) California

ENGINEERS

Unlimited Opportunities
With
HILLER HELICOPTERS

If you're looking for a job with a future, investigate the possibilities awaiting you at one of America's fastest-growing, most experienced rotary-wing manufacturers, located in an ideal climate and environment on the West Coast.

Large military contracts for both production helicopters and development work require key engineers for a long range program:

Aircraft Controls Designers	Production Planners
Airframe Designers	Ram Jet Specialists
Draftsmen (Layout & Checkers)	Rotor Designers
Electronics Engineers	Rotor Stress Engineers
Engine Installation Designers	Service Engineers
Loftsmen	Tool, Jig & Fixture Engineers
Power Transmission Designers	Weight Engineers

Excellent working conditions, over-time pay for extended work week, paid vacation, employee benefit plan. Finest educational, cultural facilities, shopping centers, ample housing. Just 35 miles south of San Francisco, Hiller is in the Bay Area's choicest locale for the "California way of living."

Write: Personnel Manager

HILLER HELICOPTERS
1350 WILLOW ROAD — PALO ALTO, CALIF

AIRCRAFT STRESS ANALYSTS
AIRCRAFT STRUCTURES ENGINEERS

Needed immediately for expanding work on Government contracts.

B.S. degree in engineering plus responsible-experience background in the aircraft field.

ENGINEERING DESIGNERS & DRAFTSMEN

With aircraft structures design experience.

MECHANICAL DESIGNERS

Design experience on complicated automatic equipment.

Send detailed resume of your education and experience to

C. C. SAYGOL
Aeronautical Engineering
HUGHES AIRCRAFT CO.
Culver City, Calif.

INSTRUMENT MECHANICS
WANTED

Positions open for qualified instrument mechanics—New Equipment—New Shop—Advise previous experience and qualifications in first letter—Replies confidential.

AIRCRAFT COMPONENTS INC.
BENTON HARBOR, MICHIGAN

ENGINEERS

We offer you excellent positions and "ground floor" opportunities in a young, aggressive and growing company. Long range programs in research, design, development and production of rotary wing aircraft for the military services. Our HELICOPTERS also have a PROVEN record of successful commercial operations.

AERODYNAMICISTS
ROTOR DESIGNERS & ANALYSTS
ENGINE INSTALLATION ENGINEERS
STRUCTURAL DESIGNERS
STRUCTURAL STRESS ANALYSTS
AERO RESEARCH SPECIALISTS
MECHANICAL DESIGNERS
MECHANICAL STRESS ANALYSTS
LOFTSMEN
DRAFTSMEN (DETAIL, LAYOUT, CHECKING)
JUNIOR ENGINEERS
TOOL, JIG & FIXTURE DESIGNERS

Connecticut is top-rated in educational, cultural, and recreational facilities.

Send detailed resume to

PERSONNEL MANAGER
THE KAMAN AIRCRAFT CORPORATION
WINDSOR LOCKS, CONNECTICUT
ON ONE OF THE FINEST AIRPORTS IN THE EAST

WANTED
C-47—DC-3—C-54 LODESTAR:
TWIN BEECH.
We Are Principals.
LEEWARD AERONAUTICAL
Fort Wayne, Ind. Phone H-2145

WANTED! TO BUY WANTED!
SURPLUS—Parachute Hardware—Safety Belts—V-Rings—D-Rings—Buckles—Adapters—Snaps—Parachute Parts—Webbing Hardware—Webbing—Full Rolls or Short Lengths—Nylon or Any Item Made of Nylon.
If you have any of these items to offer, please send samples, description of lots, quantity available and your lowest selling price. All samples will be accounted for.
JOSEPH N. FINEBERG & CO.
Greenwood 3-8544 - P.O. Box 8 - Bala Cynwyd, Pa.

B-25 WANTED
Preferably low time, late model, not converted, for use in research program.
W-9993, Aviation Week
330 W. 42 St., New York 18, N. Y.

FOR SALE
D18S Beechcraft And B-29 Hangar
This Beechcraft ready to fly on trip, being sold with the equipment our pilots required to fly in North American type operation.
This B-29 Hangar has 40,000 sq. ft. All doors, windows, toilets and light fixtures intact.
Contact Air Transport Dept.
CONTINENTAL CAN CO., INC.
100 East 42nd St. New York 17, N. Y.

MR. ENGINEER

If interested in becoming associated with a small efficient engineering group (less than 100), where advantages are that the work is personalized, and individual ability can be observed and adequately recognized, we have openings for engineers who through temperament and technical ability would qualify in—

1. STRESS ANALYSIS
2. LAYOUT
3. WEIGHTS
4. CHECKING
5. ELECTRONICS EQUIPMENT DEVELOPMENT

Long range program in Jet Fighter Design and Helicopter Development.

Write Chief Engineer

Kellett Aircraft Corp.
Central Airport Camden, N. J.
Founded in 1929

LET VULCAN HELP YOU COLD ROLL
Inquire our complete service and facilities for aviation cold rolled forms. Modern rolling machines, complete tool and die division, convenient location and adequate labor is available. Subcontract estimates and invitations for bids invited.
VULCAN METAL PRODUCTS COMPANY
5015 19th Ave., North Birmingham, Ala.

---

50 PASSENGER C46A

LICENSED

AVAILABLE FOR IMMEDIATE DRY LEASE

P. O. BOX 131
MIAMI SPRINGS, FLA.
PHONE 88-3948

To Forward Looking Engineers:

make Lockheed's great future YOUR FUTURE

Lockheed is building planes for defense, planes for the world's airlines. It's all part of our long-range production program—a program that means a better job, a better life, a better future for you in California. Lockheed needs:

Aerodynamics Engineers
Aerodynamicists
Aircraft Design Engineers
Aircraft Equipment Engineers
Airplane Specifications Engineers
Armament Engineers
Electronics Engineers
Engineering Technical Writers
Flight Manuals Engineers
Flutter and Vibration Engineers
Production Design Engineers
Stress Engineers and Analysts
Thermodynamicists
other types engineers invited to apply.

Lockheed offers fine salaries, generous travel allowances, modern working conditions, retirement plan and many other employee benefits, a future with a company known for leadership in aviation, a chance to live in California.

Note to Men with Families: Housing conditions are excellent in the San Fernando Valley, the home of Lockheed. Huge tracts are under construction. Thousands of homes have been built since World War II. Lockheed counselors will help you get settled; Lockheed social organizations and the friendly California way of life will enable you to make new friends quickly.

Write today for illustrated brochure describing life and work at Lockheed in Southern California. Use handy coupon below.

M. V. Mattson, Employment Manager Dept. 10C

LOCKHEED
AIRCRAFT CORPORATION
BURBANK, CALIFORNIA

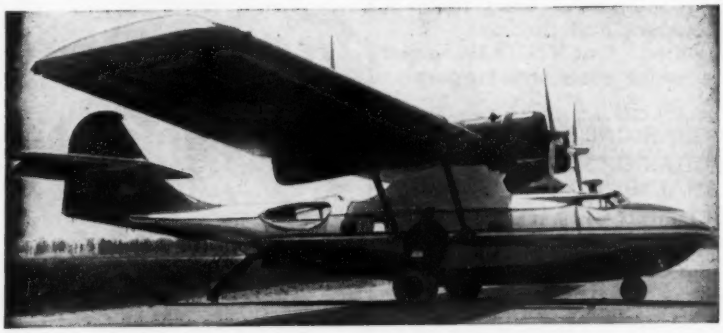
Dear Sir:
Please send me your illustrated brochure describing life and work at Lockheed.

My Name _____

My Street Address _____

My City and State _____

PBY5A Specialists



Complete Overhaul & Maintenance

Sales — Service — Parts

Complete stock of military equipment as removed from PBYs.

1830—92 engines, all conditions.

Southern California Aircraft Corp.

Box 302 Ontario, Calif.

Ph: Ontario 6-3871

AIRCRAFT & ELECTRONIC EQUIPMENT

As a leading supplier we offer a complete line of

BRAND NEW INSTRUMENTS

- FLIGHT & NAVIGATION INSTRUMENTS
- ENGINE INSTRUMENTS
- AUTOMATIC PILOTS
- INVERTERS
- AUTOSYNS
- PRECISION AUTOSYNS
- RATE GENERATORS
- SYNCHROS
- ALNICO FIELD MOTORS
- GYROS
- A.C. MOTORS
- D.C. MOTORS
- SERVO MOTORS
- TORQUE UNITS
- TORQUE AMPLIFIERS
- FREQUENCY METERS
- BLOWER ASSEMBLIES

Write for complete listings

All Instruments May Be Purchased C.A.A Certified

U. S. Export License-2140

WUX Great Neck, N. Y.

INSTRUMENT ASSOCIATES

363 Great Neck Rd., Great Neck, N.Y.

Tele: Great Neck 4-1147

LOCKHEED LODESTAR

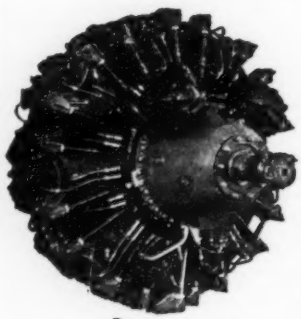
N 77777

Executive Interior — G205 engines

Low Time — Highly polished — spare engine.

MARTHA ANNE WOODRUM

Woodrum Flying Service Roanoke, Va.



R-2800's 31S-51S-75S

price $2750.00

These engines are 00:00 time since C.A.A. approved overhaul and have had ACES C.A.A. approved outside in lubrication system blower to thrust plates incorporated. They have also been block tested in our modern test cells and have been prepared for long term storage.

Exchange Price on Above.....$2600.00

C.A.A. APPROVED OVERHAULS

- R-1830-92 without exchange.....$2,500.00
  Above with exchange.....$2,290.00

All Engines Complete with Form 60-B

ALL WORK AND ENGINE SALES CARRY OUR 100 hr. WARRANTY

AIR CARRIER ENGINE SERVICE, Inc.

C.A.A. Approved Repair Station No. 3604

Intl. Airport Branch P. O. Box 236, Miami 48, Florida

Cable "ACENGSER"

ACES

DOUGLAS-C-47A

LOW AIRFRAME TIME
LICENSED READY TO GO
CARGO VERSION

Perfect for Executive Conversion

DUAL A.D.E. V.H.F.
AVAILABLE IMMEDIATELY
LODESTARS—AVAILABLE

Leeward Aeronautical Service

FORT WAYNE, INDIANA

Phone: H-2145

FOR SALE

DOUGLAS C-53 (DC-3)

6416 hrs. total. 0 hrs. since overhaul airframe and engines. (P&W 1830-92.) 24 volt. No corrosion.

$59,000.00

AIRCRAFT SALES, LTD.

5478 Wilshire Blvd.
Los Angeles 36, Calif.

WEBSTER 3-8870, 1-1681

Cable: "CRAFTAIR"

NAVION OWNERS

CAA Approved Landing Gear Fairings complete with wheel covers

Ready to install $45.00

H. E. TENNES

801 Burlington Ave., Downers Grove, Ill.

LOCKHEED LODESTAR
DOUGLAS DC-3,
LOCKHEED "VENTURA"

for details:

STONNELL & HOLLADAY

National Airport Washington, D. C.

Phone STerling 5753

FOR SALE—AIRCRAFT PARTS

West Coast's largest stock of Douglas, Constellation, AT6, P51, and C-46 parts; P&W, Wright engine parts and accessories. Complete stock AN hardware, fittings, electrical parts, etc. Plus a $45,000,000 inventory of new and surplus parts.

Complete catalog on request

COLLINS ENGINEERING COMPANY

9054 Washington Blvd., Culver City, Calif.

Watch our future ads for further listings of all types of aircraft parts!

One of America's largest stocks of UNUSED

AIRCRAFT PARTS

We own and offer all parts listed—plus many thousands more—stocked in our Baltimore warehouse!

PRATT & WHITNEY AIRCRAFT ENGINE PARTS

Quantity	Part No.	Description
166	1045A	Bearing
500	3506	Flange
130	8288	Follower Assy
27953	8427	Screw
1276	10759	Bolt
900	11210	Cover
100	11762	Guide
1157	35787-5	Bushing
2174	35787-10	Bushing
814	35814	Blower Assy.
3967	35817	Spring
280	35855	Cap
2446	35924	Washers
4200	35932	Gasket
14	36759	Rod Assy.
182	46400E	Liner
30	48346	Cylinder
1475	48360	Bearing
53	48362	Shaft
175	48363	Shaft
100	48389	Fitting
209	48390	Retainer
56	48392	Sump
533	48447	Bushing
107	48457	Adapter
390	48461	Gear
149	48468	Bearing
90	48468B	Bearing
389	48469	Bearing
470	48470	Bearing
75000	51506	Plug
395	54847	Clamp
71	57006	Cover
78	76236	Gear
565	81397	Tube
10736	84185	Cover Assy.
261	84235	Pipe
155	84281	Spacers
1351	84282	Adapter
1178	84289	Bearing
113	84487	Housing
87	84567-8	Stud
77	84591C	Nose Housing
178	84602	Bracket
30	84702	Shroud
397	84752	Bearing
14	105265	Rod Assy.

ELECTRONIC COMPONENTS

Quantity	Part No.	Description
35	RA-10-DB	Receiver
20	TA12B	Transmitter
150	DA-1F	Dynamotor
162	3611-B	Amplifier
35	MR-9B	Control Box
9000	45	Bulb
11000	1667	Bulb
1000	987	Bulb
300	AN3135-1	Bulb
97	FT213A	Mount
29	FT293	Mount
80	BX42-7	Dynamotor
6	RTA-1B	Transceiver

WALTER KIDDE FIRE AND OXYGEN EQUIPMENT

Quantity	Description
341	981280 Cylinder CO^2 w/valve Wt. Empty 18.5 lbs. Wt of Charge 12.6 lbs. Valve number 979453 J
19	M8700368 Cylinder CO^2 Wt. Empty 5.48 lbs. Wt. of Charge 3.62 lbs.
22	982512 Cylinder CO^2 w/valve Wt. Empty 11.65 lbs. Wt. of Charge 7.25 lbs. Valve number 979453 J
96	992255 Cylinder CO^2 (type 5A-hand fire extinguisher) Full wt. 14.3 lbs.
93	923748 Oxygen cylinder (full) w/valve #X4015 Charges to 1800 PSI
150	982056 Valve 1-1/2" flare tube threads
150	966129 Solenoid (28 Volts)
225	981591 Gate Valve With 3 1-1/2" Flare tube threads
151	870082 (Model A4614) pressure switch Manually or pressure operated
326	982585 Gate Valve with 1-1/4" Flare tube threads

HUGE STOCKS OF ALL TYPES *AN* HARDWARE—NEW—UNUSED. WRITE FOR DETAILED LISTINGS.

MISCELLANEOUS AIRCRAFT COMPONENTS

Quantity	Part No.	Description
22	AN5531-1	Tachometer Generator G. E. 2CM5ABW
1000	AN 5780-2	Wheel and flap position Indicator G. E.—individual cans
400	AN 5780-2	Weston Model 882-P N111602 Description as above
1500	AW 2-65B	U. S. Gauge Air Pressure Gauge (0-2000 lb.)
160	2E-492E	Pesco fuel pumps
700	TFD 8600	Thompson fuel booster pump
125	D-7818	Adel anti-ice pumps
170	2-P771-A	Pesco fuel pump AN4102-1
250	AN4014	Erie Meter Systems D-3 hand wobble pump
300	1H260k and KA	Pesco Hydraulic hand pump
478	D9530	Adel selector valve
233	D9530-2	Adel selector valve
428	D9560-2	Adel selector valve
744	D10044	Adel selector valve
2200	AN 4078-1	37D6210 Solenoid United Aircraft etc.
2000	AN 3096-4	Grimes Light assembly
800	AN 3096-5	Grimes Light assembly
380	AN 3096-6	Grimes Light assembly
75	EE 709-M2	Air associates Motor
115	P4CA2A	Parker Primers
80	AN 3213-1	Scintilla Ignition switch
568	A-9 (94-32226)	Ignition switch
687	RS-2	Mallory Selector boxes
490	AN 6203-1	Vickers Hydraulic Accumulator
88	572-3A	Eclipse Distributor Valve
90	JH-950R	Jack & Heintz Starter Motor for JH5 starters
492	S841 (94-32253)	Electric box
12	FA122	Flasher Exterior lights Wallace & Tiernan
1000	13018A	Interphone Box
244	D10051	Selector Valve (Adel)
135	10996A	Instrument Panel for Republic Seabee
144	K14949E	Windshield Wiper Kit (Marquette Metal Products)
42	400AJ3	Lear Actuator
161	420EC	Lear Actuator
160	420DY	Lear Actuator
195	550AJ	Lear Screw Jack
26	550CD	Lear Screw Jack

★ ***Send us your material lists for screening!***

WRITE—WIRE—PHONE

COMMERCIAL SURPLUS SALES CO.

4101 CURTIS AVENUE, BALTIMORE 26, MARYLAND

TELEPHONE: CURTIS 3300

COCKPIT VIEWPOINT

The Presidential Board's Pilot Decision

(Mr. Robson, an American Airlines pilot and a member of the pilots' AFL union, has been given complete freedom by AVIATION WEEK *in his expression below on a controversial subject. The opinions he expresses are his own.—R.H.W.)*

The Presidential Emergency Board created to hear the dispute between American Airlines and its pilots delivered its decision May 24. The report amounts to a stinging blow to all airline pilots for the case was intended to set many precedents. Of 23 unresolved issues between the airline and the pilots only one proposal of ALPA was accepted. All others were denied, or modified to approximately 50 percent of the pilots' request.

Biggest issue involved was establishment of new rules on working conditions. All requests for these items—maximum time on duty, determination of number of miles to be flown per month, and a relationship between hours on duty and pay hours—were denied. The Board did recommend a pay raise for co-pilots, but on a scale which still places the 2nd in command of a plane below the flight engineer, who is 3rd in command. Other items, sick leave, vacations, deadheading pay, training pay, rules on introduction of new equipment, landing pay and certain clauses on grievances and hearings were denied or weighted heavily in favor of the carrier.

► **Repercussions**—The findings of this Board will have many repercussions since pilots on Capital, TWA, United and Eastern, as well as others, are seeking similar contracts. In effect, the President has rebuffed pilots on all major airlines by saying that he is not interested in their problems. This creates a situation nearly identical to that which existed for so long on the railroads and which resulted in the last railroad strike. In both cases decisions were handed down which were known to be entirely unacceptable to the employes and the outcome in the airline case may be the same as that on the railroads.

The item of deadhead pay may illustrate the Board's feelings. This is standard fare in most transportation contracts, including many airlines. It is known as a preventative clause. It prevents excessive deadheading by requiring the carrier to pay for it. Obviously, when an employe deadheads, it is at company request. A token pay has proven to have the effect of reducing the number of requests. **When the Pacific Airlift resumed operations last winter, after the fall curtailment, the pilots of American Airlines were required to deadhead around the Pacific because they did not have to be paid for it. However, the Board flatly refused deadhead pay for American's pilots.**

In nearly all types of industry, it is commonplace for an employe to be guaranteed some portion of a day's pay when he is required to report for duty. **At present an airline pilot may be called for an extra section, which may be canceled before departure, and the pilot will receive no pay for reporting to work. Railroad personnel usually are guaranteed one half day's pay. The Board took a dim view of this practice for airline pilots although the situations are identical.**

The pilots had also requested a monthly maximum time on duty. The recommendation was that 14 hours a day be permitted (with 16 in an emergency) and that time off consist of 4 periods of 48 hours each per month. **Thus by the Board's own figures a pilot may conceivably be on duty for 368 hours in one month and be paid for only $60!**

The Board also commented on pilots in Mexico flying 100 hours a month and British pilots 125. They felt 85 was plenty good for U. S. pilots. ALPA points out, however, that all U. S. labor is better off than foreign. **If it is intended that labor revert to the standards of other countries than perhaps living conditions will also slide.**

► **Flying Kitchen?**—A possible reason for the adverse decision for the pilots may be found in the Board's comparison of the pilot's job to that of a housewife in a modern kitchen. All that is necessary, the Board felt, is to push buttons and things happen. To anyone familiar with the complexities of modern airplanes the thesis that they are flown by push buttons, and flown more easily than planes of 10 to 15 years ago, will sound strange indeed.

In short, the findings of this Presidential Board, of a supposedly pro-labor government, are so obviously anti-labor that many people are wondering if outside influence was exerted.

The evidence now indicates that the pilots will not accept this report. No further action, short of settlement of the dispute, is possible by either party until June 24, the 30-day "cooling off" period. At that time it may be possible to ascertain better the extent to which this decision will affect the air transportation industry.

—R. C. Robson

WHAT'S NEW

New Books

The Physical Nature of Flight, by Ray Holland, Jr. Published by W. W. Norton & Co., Inc., New York. $4.00.

This is a real book find.

The author, an aeronautical engineer, researcher, consultant, and former Lockheed head of aerodynamics, windtunnel and flight test, has tackled a subject that usually has been handled in a "snow 'em under" or otherwise dull fashion and has come up with a completely adequate treatment—a presentation that is tops in interest and simplicity.

The presentation simplifies for the layman the physical principles of flight. It should be an excellent primer for the aeronautical student. And it will be fine reading for the busy executive in or coming into aviation, who wants to brush up on fundamentals. Even thoroughly grounded engineers in the industry should find it worthwhile as an example of how effectively material can be presented.

The book is neither juvenile nor technically slanted. It finds a middle ground and digests a mass of what normally is considered complex into an easily readable work, replete with effective phraseology, anecdotes and sketches. The illustrations are so simple and meaningful that they need but a glance to convey a wealth of facts.

The book works its way from elementary data through the various factors and aspects of flight, taking the simple with the difficult and casting them into a down-to-earth discussion. —IS

New Addresses

The Aeronautical division of Minneapolis-Honeywell Regulator Co. is now located at 2600 Ridgway Rd., Minneapolis 13.

Adel division of General Metals Corp. has moved to new offices in the Hulman Building, 120 W. Second St., Dayton 2. Donald E. Flinn continues as Adel's Dayton representative.

Telling the Market

Bulletin 5194, covering light-duty flexible shafts and couplings having aircraft applications is available from Kuprian Mfg. Co., 246 Prospect Ave., Binghamton, N. Y. . . . A job-indexed catalog of marking devices designed to simplify their selection is available from New Method Stamps, Inc., 147 Jos. Campau, Detroit 17.

ADVERTISERS IN THIS ISSUE

AVIATION WEEK—JUNE 18, 1951

ADEL DIV. GENERAL METALS CORP. 29
Agency—The McCarty Company

AEROPRODUCTS DIV., G.M.C. 81
Agency—Campbell-Ewald Co.

AIR ASSOCIATES, INC. 75
Agency—J. Branch Briggs Adv.

AIRBORNE ACCESSORIES CORP. 7
Agency—Gray & Rogers Adv.

ALBERTSON & CO., INC. 78
Agency—E. W. Sann & Associates

AMC SUPPLY COMPANY 28
Agency—Parker Wilson Adv.

AMERICAN PHENOLIC CORP. 70
Agency—Burton Browne Adv.

ARO EQUIPMENT CORP. 62
Agency—Beeson-Faller-Reichert, Inc.

AUBURN SPARK PLUG CO., INC. 4
Agency—Richards & Webb, Inc.

AUSTENAL LABORATORIES, INC. 24
Agency—Frank C. Nahser, Inc.

BARBER COLMAN COMPANY 36
Agency—Cummings, Brand & McPherson Adv.

BELL AIRCRAFT CORP. 72, 89
Agency—Comstock & Co.

BOEING AIRPLANE COMPANY 82
Agency—N. W. Ayer & Son, Inc.

BOOTS AIRCRAFT NUT CORP. 61
Agency—Moore & Beckham, Inc.

BROOKS & PERKINS, INC. 89
Agency—Holden, Clifford-Flint, Inc.

CANNON ELECTRIC DEVELOPMENT CO. 66
Agency—Hixson & Jorgensen, Inc.

CESSNA AIRCRAFT CO. 63
Agency—Gardner Advertising Co.

CHASE AIRCRAFT CO., INC. 8
Agency—J. Branch Briggs Adv.

CROUSE-HINDS COMPANY 71
Agency—Barlow Adv. Agency, Inc.

DARNELL CORPORATION, LTD. 73
Agency—Rhea Advertising Service

DILL MFG. CO., THE 85
Agency—McDaniel, Fisher & Spelman Co.

DOW CHEMICAL CO. 56
Agency—McManus, John & Adams, Inc.

DOW CORNING CORP. 79
Agency—Don Wagnitz Adv.

EATON MANUFACTURING CO. 20
Agency—Clark & Rickerd, Inc.

EDISON, INC., THOMAS A. 32
Agency—Gotham Adv. Company

ECLIPSE-PIONEER DIV. OF BENDIX AVIATION CORP. 76
Agency—McManus, John & Adams, Inc.

ESSO EXPORT CORP. 37
Agency—McCann-Erickson, Inc.

EX-CELL-O CORPORATION 35
Agency—Holden, Clifford, Flint, Inc.

FAFNIR BEARING CO., THE 5
Agency—Horton-Noyes Co.

FAIRCHILD ENGINE & AIRPLANE CORP. Third Cover
Agency—Buchanan & Co., Inc.

FLYING TIGER LINES, INC. 39
Agency—Heintz & Co., Inc.

GENERAL ELECTRIC COMPANY ..... Fourth Cover
Agency—G. M. Basford Co.

GENERAL LABORATORY ASSOCIATES 80
Agency—J. Branch Briggs Adv.

GILFILLAN BROS. 42, 43
Agency—Erwin, Wasey & Co., Ltd.

GLIDDEN CO., THE 47
Agency—Meldrum & Fewsmith, Inc.

GOODRICH CO., THE B. F. 3
Agency—Batten, Barton, Durstine & Osborn, Inc.

GOODYEAR TIRE & RUBBER CO., INC. Front Cover
Agency—Kudner Agency, Inc.

GREER HYDRAULICS, INC. 55
Agency—Dunwoodie Advertising

GULF OIL CORPORATION 40
Agency—Young & Rubicam, Inc.

HARTWELL AVIATION SUPPLY CO. 23
Agency—The McCarty Co.

INTERNATIONAL NICKEL CO., INC., THE 64
Agency—Marschalk & Pratt Co.

JACOBS AIRCRAFT ENGINE CO. 45
Agency—J. Branch Briggs Adv.

JOY MANUFACTURING CO. 33
Agency—Walker & Downing Adv.

LELAND, INCORPORATED, G. H. 97
Agency—Ankeney Adv. Agency

LEWIS ENGINEERING CO., THE 84

MACWHYTE COMPANY 10
Agency—Needham, Louis & Brorby, Inc.

McGRAW-HILL BOOK CO., INC. 54

MELETRON CORPORATION 59
Agency—Welsh-Hollander Adv.

MINNESOTA MINING & MFG. CO. 26
Agency—MacManus, John & Adams, Inc.

MONADNOCK MILLS 89
Agency—H. B. Humphrey, Alley & Richards, Inc.

NORTH AMERICAN AVIATION, INC. 58, 87
Agency—Batten, Barton, Durstine & Osborn, Inc.

PACIFIC AIRMOTIVE CORP. 25
Agency—Fasig Company, The

PARKER WHITE METAL CO. 60
Agency—Davies & McKinney Adv.

PIASECKI HELICOPTER CORP. 88
Agency—B. K. Davis Bro.

REYNOLDS METALS COMPANY 22
Agency—Price, Robinson & Frank, Inc.

ROHM & HAAS COMPANY 67
Agency—John Falkner Arndt & Co., Inc.

SAFE FLIGHT INSTRUMENT CORP. 53
Agency—Davis-Parsons, Inc.

SEARCHLIGHT SECTION 90, 91, 92, 93, 94, 95

SERVICE STEEL COMPANY 72
Agency—Claude E. Whipple Adv.

SMITH-MORRIS COMPANY 30
Agency—Holden, Clifford, Flint, Inc.

SPRAGUE ENGINEERING & SALES 44
Agency—O. K. Fagan Adv. Agency

STALWART RUBBER CO., THE 65
Agency—Penn & Hamaker, Inc.

STANDARD PRESSED STEEL CO. 74
Agency—R. E. Lovekin Corp.

STANDARD PRODUCTS, INC. 59
Agency—The McCormick-Armstrong Co.

SUNDSTRAND MACHINE TOOL CO. ..... Second Cover
Agency—Howard H. Monk & Assoc.

SWEDLOW PLASTICS CO. 34
Agency—Francis D. Gonda Adv.

TEXAS ENGINEERING & MFG. CO. 38
Agency—J. B. Taylor, Inc.

THERMO ELECTRIC COMPANY 44
Agency—Fred Lange Associates, Inc.

THOMPSON CO., H. I. 57
Agency—Lockwood-Shackelford Co.

TINNERMAN PRODUCTS, INC. 48
Agency—Meldrum & Fewsmith, Inc.

TOMKINS-JOHNSON CO. 69
Agency—Beeson-Faller-Reichert, Inc.

TORRINGTON CO., THE 52
Agency—Hazard Adv. Co.

TUBE METHODS, INC. 87
Agency—John Miller Adv. Agency

UNITED AIRCRAFT CORP. 50, 51
Agency—Geyer, Newell & Ganger, Inc.

UNITED STATES STEEL SUPPLY CO. 41
Agency—Batten, Barton, Durstine & Osborn, Inc.

U. S. MOLDED SHAPES, INC. 86
Agency—Hall Adv. Agency

WESTERN GEAR WORKS 46
Agency—West-Marquis, Inc.

WESTON ELECTRICAL INSTRUMENT CORP. 40
Agency—G. M. Basford Co.

WITTEK MANUFACTURING COMPANY 77
Agency—The Advertising Corp.

WOLFE CO., FRANKLIN C. 36
Agency—Welsh-Hollander Adv.

WYMAN GORDON CO. 6
Agency—John W. Odlin Co., Inc.

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT
Positions Vacant 90–93

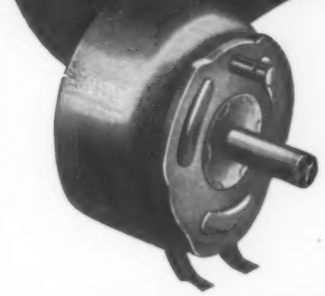
SPECIAL SERVICES
Contract Work 93

PLANES—EQUIPMENT
(Used or Surplus New)
For Sale 93–95

WANTED
Planes—Equipment 93

LEDEX

ROTARY SOLENOID



SOLVES MANY REMOTE CONTROL PROBLEMS

The many production applications of Ledex Rotary Solenoids vary from the dependable, snap-action tripping of airborne bomb releases to the actuation of rugged, hydraulic valves in heavy duty materials handling equipment.

Five Ledex Rotary Solenoid models are manufactured. Diameters range from 1⅛ to 3⅜ inches. Predetermined rotation up to 95° can be engineered to suit your product's requirements. Starting torques for 45° stroke range from ¼ pound-inches to 50 pound-inches.

We supply to quantity users and solicit the opportunity to be of assistance in engineering a Ledex Rotary Solenoid to meet your product's requirements.

MODEL NO.	2	5	6	7	8
Diameter	1¼"	1⅞"	2¼"	2¾"	3⅜"
Torque lb./inches	¼	5	10	25	50
Weight lbs.	⅛	½	1	2¼	4¼

Magnetic action moves the armature along the solenoid axis. This action is converted into a rotary motion by means of ball bearings on inclined races.

WRITE DIRECT TO

G. H. Leland INC.

105 WEBSTER STREET

DAYTON 2, OHIO

EDITORIAL

Pilots, Painters & Safety

The Presidential Emergency Board reporting on the American Airlines pilot dispute notes parenthetically that piloting airliners is no longer a particularly hazardous job.

It lists some comparative extra premiums per $1,000 of ordinary life insurance as quoted by a leading life insurance company:

Airline pilot	$2.50
House painter	2.50
Bridge painter	5.00
Railroad detectives & watchmen	5.00

Mortality rate per thousand domestic airline pilots ranged between 16 and 28 in the 1930-1936 period. It was 1.5 in 1948 and 1.1 in 1949.

These figures tell an impressive story of the remarkable improvement in airline safety in less than 20 years.

Everyone connected with aviation has a right to some share of credit for this accomplishment. But the quest for a perfect safety record—as impossible of attainment as it may appear to be—must always be sought vigorously, unrelentingly.

And the similarity between the insurance company's ratings of the relative hazards of airline pilots, painters, detectives and watchmen should be considered in the light of the great accomplishment it is, and never as fodder for any kind of propaganda to undermine the value of the trained and skilled pilot in the modern airliner.

These aviation safety figures were not achieved by house-painter piloting, and they would start disintegrating instantly if we installed house-painter piloting. With all due respect to painters, detectives and watchmen, who perform honorable and much needed missions in modern society, we want none of their ilk up in the front office of any airliner we board.

That goes for the wondrous electronic age just ahead of us, too, when everything will whir automatically—till one of the widgets blows a tube. Please, we want no painters or watchmen to take over at that crucial moment.

Washington Is Like This

Here is the latest incredible installment on our continued story about government contract lists, and how first you see them, then you don't. **Today's says you do.** Even more so than our May 28 installment said.

The Munitions Board in all its huffy stuffiness clamped down the lid on dollar figures for Air Force and other government contracts with industry. Even on things like dish cloths and lawn mowers. Publicity for exact amounts of such—and other—government purchases was perilous to the national security, according to Munitions' ruling.

So AVIATION WEEK and other publications stopped printing contracts and a lot of taxpayers stopped getting this information about how their money was being spent. Especially, though, the Administration in Washington was spared the embarrassment of showing how few contracts were going to small business. This was the real purpose of the iron curtain.

Now we learn that all this time the Wage & Hour and Public Contracts Divisions of the Labor Department were going along as they have for these many years, mimeographing and distributing to small lists each month the contracts awarded under the Walsh-Healey Act. This means a very high percentage of government contracts.

Words now fail us, as we stand by to watch the Munitions Board wake up and try to circumvent the Walsh-Healey Act. That law requires due publicity for such information.

An Old & Tragic Story

A tragic illustration of the danger of stunting at air shows appeared in newspapers—probably hundreds of them—some weeks ago. As published in the New York Times, it read:

> STUNTING PLANE CRASHES; 2 DIE
>
> **Rockaway, Ore., April 29 (UP)**—Two men died today when a stunting lightplane plunged into the sea off the beach recreation area as hundreds of Tillamook County Centennial celebrants looked on. Those killed were Arlie Johnson, 32, and Murray Pate, 26, both of Tillamook.

So we open the air show season.

Stunting anytime is foolish for the participants, reprehensible in its danger to others, thoughtless of the reputation to aviation. It does aviation no good—however you may look at it.

Managements of civilian air shows who permit stunting invite needless death and injury.

AVIATION WEEK will continue to point out this barbaric practice descending from an earlier era when aviation was in its infancy, without any sense of responsibility, appealing to the morbidity that brought out thousands to the ancient Colosseum.

We invite you readers to send us all reports of such needless fatalities and casualties which may occur in your area.

Learn From the Rails!

So comes June 1 and the Pullman Co. slaps a 15-percent increase on all its rates. Here it is suffering from chronic customer-lack, so it hikes fares that will bring even fewer customers. It forgets about offering better service or attracting new business with special fares, in the good old American tradition of enterprise.

We hope the airlines are intelligent enough to capitalize on Pullman's shortsightedness and not get cocky over all their increased business. If they do raise rates, they'll be playing directly into the hands of the nonskeds—who have just won a permanent court injunction to prevent CAB's order restricting them to three flights a month.

—Robert H. Wood